THE OTB

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OFFICIAL JOURNAL OF THE ANTIQUE WIRELESS ASSOCIATION, INC.

Published for the collector, historian and old-time radio operator

DECODING VINTAGE VIDEO RECORDINGS

SEE PAGE 12

THE OLD TIMER'S BULLETIN

OFFICIAL JOURNAL, ANTIQUE WIRELESS ASSOCIATION, INC.
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THE PRESIDENT'S MESSAGE

The AWA Board is continuing to further the separation of the club and the museum into two distinct organizations, in line with the requirements of the Board of Regents of the State of New York for the museum to obtain the permanent charter that we have been discussing over the past year. One major element of this separation is that the museum and the club, the AWA per se, must have separate boards and officers, with not more than a 30% overlap. This will be posing a problem but it can be handled.

Another requirement of a not-for-profit organization, which the AWA is, is that the membership at large be given a larger voice in the management of the organization. The legal parameters of this requirement have been explored and action taken to comply. You will recall that the November, 2000 issue of *The OTB* included a proxy form which we asked the members to fill out and return, thus registering their votes on certain matters. I am pleased to report that the return was over 25%, and that the board was given an overwhelming mandate.

For the past year we have also been moving in the direction of publishing in *The OTB* both the financial report of the AWA and a summary of the minutes of the Board meetings. Some members will no doubt protest the allocation of scarce space to this sort of material, but the board now feels that it is necessary. Present plans are that these reports will be included in the May *OTB*.

Further to the separation of the two organizations, a Director of the Museum has been appointed to work with the Curator, Ed Gable. He is board member Tom Peterson, who brings to the job a wealth of background and experience in working with museums.

Two more items should be noted. First, the board has authorized the issuance of life membership to those who wish to take advantage of it. The rate has been established at twenty times the annual dues, which at present works out to $300. Application accompanied by the funds should be sent to the membership secretary, Joyce Peckham.

The other item that I wish to call your attention to is the annual report of our Web Page Coordinator, Chuck Schwark, which you will find in the "AWA News" section. If you haven't seen this "window to the world" telling people who and what we are, please take the time to look it over. If you don't have computer capability at home, many public libraries now have terminals that are available to the public. Our Web address is on the back cover of this issue, right under the Museum heading at the top of the page.

LETTERS TO THE EDITOR

All letters to the Editor are read with interest and attention, though not all can be published in this column. Letters may be paraphrased, shortened or otherwise edited to fit the available space. The statements made by our correspondents are their own opinions and do not necessarily reflect the views of either the OTB *staff or the Antique Wireless Association.*

AUTO VOLTAGES AND ELECTRONIC GEAR

I haven't seen anything in *The OTB* recently on the relationship between auto electronic equipment and auto electrical systems. When 6-volt tubes for auto radios were developed, the filament voltage was fixed at 6.3, the voltage of an open-circuit, fully-charged, 3-cell lead/acid battery. This must have seemed like a good idea at the time, but batteries on charge in a car might see as much as 7 to 8 volts. Generally, the only time a car radio saw 6.3-volts was "on the way down" as battery voltage fell from its value while on charge to the 5½volts usually presented at the set (due to the usual inadequate wiring) by a "resting" battery. The voltage fell even lower, perhaps to 4 volts, while cranking, and it was typical for the radio to be automatically disconnected during this operation to prevent vibrators from sticking.

Earlier this year, the IEEE ran an article regarding wayward voltages in our present 12-volt cars. Every year more and more electrical and electronic gear is connected to the battery. And voltages can range from about eight (cold cranking) to about 16 (cold charging). This requires the electronic gear to deal with an input variation of 2:1!

The proposed solution is an 18-cell lead/acid

FROM THE EDITOR

I think you'll find this issue one of our more interesting ones. Mechanical television enthusiasts will find no less than three articles to enjoy. Our untiring historical contributor, Jim Rybak, is back with a review of John Baird's technique for transmitting color television with scanning disks in 1928. David F. McLean, who joins us from the UK, enlivens our pages by sharing some of his work in "playing back" some of Baird's original "Phonovision" discs as well as some amateur disc recordings made during the BBC's 30-line TV transmissions of the 1930s.

Dick Brewster, our regular TV columnist, has sent us a piece on experimental educational television programs produced at the University of Iowa during the same period. These days Dick is sending in his columns from the Mercy Ship *Anastasis*, where he and his wife are serving as volunteers.

Newcomers to the hobby have more fodder with another installment of Bill Fizette's continuing "Fixing Up Those Nice Old Radios" series as well as a reprint of Lane Upton's 1973 *OTB* article "The Rejuvenation of Vacuum Tubes." And Charles Kirsten, applying a little ingenuity, shows how an old tester of no particular merit can be turned into a valuable instrument for conveniently checking tubes with exotic bases.

Our hams will find the results of the Bruce Kelly 1929 QSO Party—as well as a rundown on the rules for the upcoming Cundall OT DX contest. And those whose "fists" have tired during the rigors of the QSO party might like to swap their hand key for a paddle next time they fire up their Hartleys! Frank Lotito's Keying Interface artcile shows how to do it. A particularly fascinating installment of Frank's "Below 535" column has a guest article by Howard F. Holden WB2AWQ. Howard reviews the work of the members of the 10-70 Repeater Association, Inc. of NJ in restoring the radio room of the World War II sub USS *Ling*.

John Casale, who takes over this issue as Key and Telegraph editor, treats us to a vivid recreation of the incredible evening in 1871 when Morse's "farewell message" was sent out over the Western Union wires to every major city in the U.S. and Canada.

And that just scratches the surface of the interesting material waiting for you between these pages. Read and enjoy!

I need to note that Part 2 of Dr. Hugo Holden's article *Grid Leak Detection in the 1920s*, promised for this issue, will appear in May instead.

We close on the sad note that this issue also contains George Freeman's goodbye to that staunch AWA supporter, IHRS sparkplug, and friend of the antique radio hobby Ross Smith.

We'll miss you, Ross.

---

battery having an open-circuit voltage of 36 and a charging voltage as high as 42. This would feed a voltage regulator that would provide a stable output voltage of 14 to the equipment no matter what. Target date for introduction: 2005. This would mean a much better and longer-lived starter motor could be used.

RAY LARSON
West Los Angeles, CA

MORE TESLA COMMENTS

I don't like to repeat myself, but if the editor permits, I will. Re. Mike Twose's letter (*OTB*, Vol 41, no. 4), Tesla's concept of wireless communication and/or transmission of electric power by conduction of current through the earth from a ground terminal was unconventional, but it does not require special theories to explain.

According to standard electromagnetic theory, it would work; the only question being how well. For example, the dome-shaped structure that Mike Twose refers to served as a capacitance, not a radio antenna, as explained in my articles in *The OTB*, Vol. 40, Nos 1 and 2.

Regarding further investigation of Tesla's wireless principles, I would make the following suggestions:

(1) Verifying anecdotes probably is a lost cause, although we should keep our ears and minds open. Personally, I am skeptical of claims that exceed Tesla's well documented testimony in *Nikola Tesla On His Work With Alternating Currents* by Leland Anderson.

(2) Testing Tesla's wireless concepts experimentally would be difficult for several reasons. If regulators categorized such experiments as low-frequency radio, they would be limited to microscopic power in the USA and Canada. If experiments could be carried out at the voltages and earth currents that Tesla used, they probably would interfere unacceptably with other forms of wire and

wireless communication. Even if these problems could be overcome, it would be difficult to distinguish whether signals were being received primarily as earth currents or as radio waves.

(3) This leaves a theoretical investigation as perhaps the most promising route. Testing Tesla's wireless concepts would be a mathematically difficult but straightforward problem. It would be a good theoretical thesis topic for a graduate student in physics or engineering. It would be nice if one of the organizations that promotes Tesla's accomplishments would sponsor such a research project. There are philanthropies that likely would fund it. I have expressed these views in private correspondence, but no one has acted on the suggestion as far as I know. At the least, the project should settle questions of historical interest, and, who knows, it might turn up some practical applications.

HENRY M. BRADFORD
Wolfville, Nova Scotia.

I was pleased to see that Mike Twose's November letter to *The OTB* give us specific references to Tesla's power transmission claims. Indeed, in patent #645,576, Tesla "concludes," among other things, that thousands of horsepower may be transmitted over thousands of miles (p. 4, line 130).

However, Tesla was not, as was implied, using unknown "forces." Rather (as he explains quite clearly), his intent was to harness the electrical conductivity of the upper atmosphere.

All evidence indicates that the genius was unsuccessful in this particular endeavor.We know of no documents to the contrary and, as Henry Bradford noted, "(Tesla) was not shy about talking about his achievements." Although Tesla, in his patent language, implies sweeping possibilities, he clearly came to realize that the conductivity of the upper atmosphere is simply far too feeble, and the impedance required to couple to it far too great, to serve any useful purpose.

The same November letter references a number of alternative-science books which associate Tesla with mysterious "different physics" and "lost science." On the contrary, Tesla was a world-class engineer, and much of his success derived from his solid understanding of the same science we use today. I doubt that Tesla would have wanted any part of such imaginings.

GARY GORDON, K6KV
Saratoga, CA

In his letter on Tesla (November, 2000 *OTB*), Mike Twose states, "An electrical impulse will travel along a wire faster than the speed of light which, according to Einstein, cannot happen." This is clearly not generally true. If it were, a wire half-wave dipole antenna would have to be longer than a free-space half wavelength at the same frequency (given by half the velocity of light [in a vacuum] divided by the frequency of the radiation), whereas it is always found to be shorter. In other words, the velocity factor of any transmission line is never greater than unity, although in the case of a thin straight wire it is only a few percent less.

Since any electrical impulse can be expressed as a superposition of sine waves of different phases, amplitudes, and frequencies by Fourier analysis, and since the above observation on the length of half-wave dipoles has peen found to be valid over a wide range of frequencies, the impulse travelling along a wire faster than the speed of light cited by Mr. Twose can only result from the use of a wire with some very strange properties—perhaps negative capacitance and inductance!

DERICK OVENALL, N3EGR
Wilmington, DE

Readers may be interested to learn that a PBS documentary on Tesla, "Tesla, Master of Lightning," aired on PBS on December 12th. While it is obviously too late to catch the show (except in some future rerun), a companion book is available at Barnes and Noble stores, and both the book and a home video version are available through PBS Video (1-800-playpbs). Also check the informational web site at pbs.org/tesla.—Ed

NEW RADAR BOOK

Radar buffs will be interested in learning of the availability of two previously-unpublished documents from 1942 on the development of radar and radar tubes. One is a summary history of U.S. Army radar to the end of 1941, that goes into detail of recent events, and was originally classified "secret."

The other is a trip report by an Eimac engineer to all of the agencies working with radar, an internal document that has only now surfaced in the company archives. Besides detailing all the Eimac tubes being used in radar development at the time, this also has candid assessments of people in charge and work being done. Eimac tubes with their mostly-glass construction turned out to be ideally suited to high-voltage pulse operation, so the company benefitted greatly from wartime contracts.

Editor Ludwell Sibley has reprinted these two manuscripts, with explanatory notes and contem-

(continued on page 11)

AWA NEWS

***OTB* POLICY ON PROMOTING EVENTS:** The *OTB* is pleased to list the meets and meetings of any established antique radio organization, whether or not it is associated with the AWA. Do not send your information directly to the *OTB* Editor. Please send it to Joyce Peckham, Box E, Breesport, NY 14816. Closing date is six weeks prior to first day of month of issue.

Calendar of AWA Activities

MARCH 22-24
CC-AWA Spring Meet in the Carolinas

APRIL 18-19, 21-22
Linc Cundall OT DX Contest

MAY 5
AWA Spring Meet

MAY 5
Semi-Annual Board Meeting

MAY 18-19
Radio Daze 2001

JUNE 8-9
IHRS/AWA 30th Spring Meet

Calendar of Meets

(AWA logo identifies AWA-sponsored events)

RADIO XXXII

February 18

Sponsored by the Greater Boston Antique Radio Collectors; organized by Antique Radio Classified Magazine; 8:00 a.m. to 1:00 p.m. at Westford Regency Inn, Westford, MA. From I-495 take exit 32; follow "To. Rt. 225" sign. At stop light turn rt. onto Rt. 110 West for 0.4 miles; Westford Regency is on your right. Room reservations: 1-800-543-7801. Fees $7.00 (spouse and children free) plus $20.00 per table. 7,900 square feet, 100+ tables available. Informal dinner previous evening 7 p.m. to 9 p.m. (Dutch, no reservations necessary) at Yangtse River Chinese Restaurant, 2.2 miles west of Westford Regency on Rt.110. Register at the door or preregister: with credit card call 978-371-0512 or fax 978-371-7129; by check or MO (made out to A.R.C.), send to Radio XXII, c/o A.R.C,, P.O. Box 2-W20, Carlisle, MA 01741. Info: 978-371-0502; arc@antiqueradio.com

25TH ANNIVERSARY SPRING MEET IN THE CAROLINAS

March 22-24, 2001

At Sheraton Charlotte Airport Hotel, Charlotte, NC. Includes programs, CC-AWA Annual Membership meeting, flea market, old equipment auction, and (new!) Friday evening banquet with entertainment followed by an "open house" reception in the contest room to view entries. Programs begin Thursday at 1:30 p.m.; flea market opens Friday at 8 a.m., with old equipment auction following in the afternoon; Saturday: more flea market, equipment contest judging, and members' luncheon. Fees (at preregistration/at door): general admission $8/$18; vendor space $15/$25; banquet $25; member lunch $12; special Saturday-only admission, $5.00 (available only at gate Sat. a.m.). Info: Ron Lawrence, kc4yoy@trellis.net or 704-289-1166; CC-AWA Web Page: cc-awa.org

AWA SPRING MEET

May 5

The exciting annual AWA Spring Meet at the Museum Annex, still at NO admission charge, is again the first Saturday in May. Featuring a large flea market, the famous sale of junque from the AWA warehouse with even more exciting items this year, a commission-free member auction, special event prices on sale of AWA publications and CD's and by popular demand...the legendary roast beef dinner provided on-site by the American Legion. The schedule is:

7:00 a.m. to noon: flea market. $3.00 charge for parking space. New, larger paved parking lot! *9:00 to 11:00 a.m.:* Annex tag sale. More stuff than ever in all categories.

11:00 to noon: Annex guided tour. Flea market and Annex sales continue.

Noon to 1:00 p.m.: Famous Legion lunch. Limited space, buy tickets early at only $9.00 each.

1:00 to 2:00 p.m.: Member's buyer to seller no fee auction. Colonel Ed Gable, Auctioneer.

2:00 to 3:00 p.m.: Museum open. AWA Board Meeting

Location: AWA Annex Building, 6910 Rte. 5&20 (near intersection with Rt. 444), Bloomfield, NY—on the grounds of the American Legion Post. Questions to Ed Gable, Museum Curator, at (716) 392-3088 or k2mp@eznet.net

RADIO DAZE 2001

May 18-19

Presented by Northland Antique Radio Club and the Pavek Museum at the Comfort Inn of Plymouth, 3000 Harbor Ln., Plymouth, MN 55447. Info: Jim Thompson (RadioJim@worldnet.att.net) or Kip Wallace (KipWallace@dl-inc.com).

IHRS/AWA 30TH REGIONAL SPRING MEET

June 8-9

New Location: Hancock County Fairgrounds, Greenfield, IN, 9 miles east of Indianapolis. I-70 at State Rd. #9. Exit 104. This site is mostly under roof. Located on Apple St. about 2 blocks N. of US-40 and 1/2 mile E. of SR-9. (Just north of our Fall Foliage meeting place.) Water and electric hookups available for nominal fee. Contest categories: 1) Radios made in Indiana, 2) Speakers, 3) Colorful radios, 4) Factory-made Crystal Sets and 5) "Open" category. There will be Silent Donation and Consignment auctions. Motels: (All located South of I-70 on SR-9) Lee's Inn, 2270 N. State St., 317-462-7112 or 1-800-733-5337. Super-8, 2100 N. State St., 317-462-8899 or 1-800-800-8000. Comfort Inn, 178 Martindale Dr., 317-467-9999 or 1-800-228-5150. Holiday Inn Express, 2070 N. State St., 317-467-0999. Dollar Inn, 2180 N. State St., 317-457-0067. Info: Glenn Fitch, 765-565-6911 or Herman Gross, 765-459-8308, w9itt@mindspring.com

EXTRAVAGANZA '01

July 6-8

Sponsored by Michigan Antique Radio Club. For info, contact John Reinicke at 248-626-4895.

Recurring Meetings

• **California Historical Radio Society**—For info on current meetings, call the CHRS hotline: (415) 821-9800.

• **CARS**, the Cincinnati Antique Radio Society—Meets on the third Wednesday of each month at ITT Technical Institute, 4750 Wesley Ave., Norwood (Cinti.) Ohio. For more information contact Greg Tierney, (513) 732-1844, or Bob Sands, (513) 858-1755.

• **Carolinas Chapter of the AWA**—Hosts four "mini-swap-meets" each year (in January, May, July and October) plus an annual conference, "Spring Meet in the Carolinas," on the 4th weekend in March. Executive committee meets approximately quarterly. For more info, visit the Web site at CC-AWA.ORG or contact Ron Lawrence, KC4YOY, Chapter President, P.O. Box 3015, Matthews, NC 28106-3015; phone (704) 289-1166; e-mail kc4yoy@trellis.net

• **Central Ohio Antique Radio Assn.**—Meets at 7:30 p.m., third Wednesday of each month at Devry Institute of Technology, 1350 Alum Creek Rd., Columbus. (1-70 Exit 103B). Contact: Barry Gould (614) 777-8534.

• **Delaware Valley Historic Radio Club**—Meeting and auction begins 7:30 p.m. on the second Tuesday of each month. Location: Telford Community Center on Hamlin Ave. in Telford, PA. Annual dues: $15.00, which includes a subscription to the club's monthly newsletter *The Oscillator*. For more info contact Bill Overbeck at (610) 789-8199 or Dave Snellman at (215) 345-4248. Club mailing address: P.O. Box 847, Havertown, PA 19053.

• **Houston Vintage Radio Association**—Meets second Tuesday each month (except Jan. and Dec.) at Lai Lai Restaurant, Tides II Motel, Houston Medical Center, Main and Holcombe Sts., Houston, TX. Meetings include auction/program, 7-10 p.m. Assoc. publishes *Grid Leak* quarterly, monthly activity announcements. Membership $15/yr. Write: HVRA, P.O. Box 31276, Houston, TX 77231-1276, or call Richard Collins, (713) 778-0721.

• **Hudson Valley Antique Radio & Phono Society**—Meets third Thursday of month, 7 p.m. Meeting, swap meet, and membership info: Peter DeAngelo, President, HARPS, 25 Co. Rt. 51, Campbell Hall, NY 10916. (914) 496-5130.

• **London Vintage Radio Club**—This Ontario, Canada club meets in London on the last Saturday of January, March, May, June and November. Annual flea market held in Guelph, Ontario in September in conjunction with the Toronto club. Contact: Lloyd Swackhammer, VE3I1A, RR#2, Alma, Ontario, Canada. (519) 638-2827.

• **Mid-Atlantic Radio Club**—Meets monthly, usually the third Sunday of the month at the New Hope Seventh Day Adventist Church, Burtonsville, MD. Contacts: President, Ed Lyon, 11301 Woodland Way, Myersville, MD 21773-9133, (301) 293-1773, e-mail lyon@fred.net or Membership Chair, Paul Farmer, (703) 960-0650, e-mail: oldradiotime@hotmail.com. Website www.maarc.org

• **New Jersey Antique Radio Club**—Meets second Friday each month, 7:30 p.m. Holds three

Call For Papers For AWA Review Volume 14

Papers are now being accepted for the next AWA Review, to be published in 2001. To expedite matters, a brief summary of the material should be sent to the editor:

Thomas B. Perera, W1TP
11 Squire Hill Rd.
North Caldwell, NJ 07006
tomperera@w1tp.com

annual swap meets. Contact (send SASE) Phil Vourtsis, 13 Cornell PI., Manalapan, NJ 07726, (732) 446-2427.

• **Northwest Vintage Radio Society**—Meets second Saturday of each month (except July and August), at or about 10 a.m., at Abemathy Grange Hall, 15745 S. Harley Ave., Oregon City, OR. Members display radios, exchange information. Guests welcome at all meetings and functions, except board meetings. For info, write the Society at P.O. Box 82379, Portland, Oregon 97282-0379.

• **Oklahoma Vintage Radio Collectors**—Meets second Saturday each month, Oklahoma Station Bar-B-Q, 4333 NW 50th St., Oklahoma City, OK. Visitors welcome. Dinner/socializing, 6 p.m.; meeting at 7 p.m. Membership, $12/yr., includes monthly *Broadcast News*. Info: SASE to OKVRC, P.O. Box 50625, Midwest City, OK 73140-5625, or call (405) 755-4139 or (405) 732-6070.

• **Ottawa Vintage Radio Club**—Meets monthly (except June and July) in Conference Room, *Ottawa Citizen*, 1101 Baxter Rd., Ottawa, Ontario. Contact: Tom Devey, 601-810 Edgeworth Ave., Ottawa, ON K2B 5L5, (613) 828-5152. Membership: $10 Canadian/yr.

• **Society for Preservation of Antique Radio Knowledge**—Meets at 7:30 p.m., fourth Tuesday of each month in the party room at Cassano's Pizza Parlor, 1700 East Stroop Rd., Kettering, OH. Membership, $12/year. Write SPARK, P.O. Box 292111, Kettering, OH 45429; e-mail sparkinc@juno.com or call Dan Gebhart (937) 299-9570.

• **Texas Antique Radio Club**—Meets alternate months in Kyle and Shertz, TX. Contact: Ron Manning, President TARC, 133 East Huisache Ave., San Antonio, TX 78212. Phone (210) 734-6831; e-mail ronmeg@gateway.net; website www.gvtc.com/~edengel/TARC.htm

Service Sources Available

The AWA Source Sheet is a listing of parts suppliers and services for the radio collector. Cost: only a business-size self-addressed stamped envelope to AWA, Box E, Breesport, NY 14816.

AWA Slide/Video Program

The Antique Wireless Association has available several historical documentaries to loan to affiliated organizations for club meetings and programs. There is no charge for this service

With the Chapters

Our Fall Swap Meet was a tremendous success. I counted around 35 well stocked vendors and there must have been 150 - 200 attendees. This has to be best Swap (mini) Meet we've had yet. My thanks to Brad Jones for all his hard work on this event.

The next event for the Carolinas will also be history by the time you read this. It is the second Winter Swap Meet (January 27th) in Columbia SC at Caughman Park. I just hope that the weatherman is on our side this year. Last year we drove from Charlotte to Columbia in sleet and snow. As cold as this winter has been here in the Carolinas, averaging about 15 degrees below normal for over a month now I'm sure that I'm not the only one with a high level of cabin fever.

The last details for the 25th Anniversary "Spring Meet in the Carolinas" are being taken care of, I hope to have brochures in the mail the first week in February. If you have attended the Charlotte Spring Meet in the last 3 or 4 years you will receive a brochure, there is no need to write and request one. Everyone in our data base will be automatically receive a brochure as soon as they are ready.

The next event here in the Carolinas after the Charlotte Meet is our Spring Swap Meet in Spencer NC on May 12th at the North Carolina Transportation Museum "Spencer Shop." This will be about the 6th year for this event and is always enjoyed by all who attend.

The Carolinas Chapter has a new e-mail reflector. It is open to everyone interested in old radios and what's happening in the collecting hobby in the Carolinas. You can subscribe to it by sending a blank e-mail to: cc-awa-subscribe@egroups.com I look forward to seeing everyone again this year in March. It'll be here before you know it. 73, Ron Lawrence KC4YOY CC-AWA President & Conference Chairman. E-mail kc4yoy@trellis.net; Phone 704-289-1166; CC-AWA Web Page cc-awa.org.

YEAR-END WRAP-UP

AWA Web Site Activity

Activity for the year 2000

The AWA website has steadily gained in popularity since startup in May 1999. The average hits per month for the year 2000 totaled 1,980 (Peak months were September and October due to AWA Conference and followups.) Average hits per day totaled 66.

Our visitors' operating systems

87% of the hits were from Windows 2000, 98, 95, 3.1, and NT computers; 13% were from Mac, Unix, Linux, WebTV, OS/2, and unknown computers.

Countries (Domains)

Since startup in May 1999, we've received hits from the following domains, comprising every continent except Antarctica.

ARGENTINA (.AR)
ARUBA (.AW)
AUSTRALIA (.AU)
AUSTRIA (.AT)
BELGIUM (.BE)
BERMUDA (.BM)
BRAZIL (.BR)
BRUNEI DARUSSALAM (.BN)
BULGARIA (.BG)
CANADA (.CA)
CAYMAN ISLANDS (.KY)
CHILE (.CL)
CHINA (.CN)
COLOMBIA (.CO)
Commercial (.COM)
CROATIA (.HR)
CYPRUS (.CY)
CZECH REPUBLIC (.CZ)
DENMARK (.DK)
ECUADOR (.EC)
Educational (.EDU)
EGYPT (.EG)
ESTONIA (.EE)
FIJI (.FJ)
FINLAND (.FI)
FRANCE (.FR)
GERMANY (.DE)
GIBRALTAR (.GI)
GREECE (.GR)
GREENLAND (.GL)
HONG KONG (.HK)
HUNGARY (.HU)
ICELAND (.IS)
INDIA (.IN)
INDONESIA (.ID)
Int. Organizations (.INT)
IRELAND (.IE)
ISRAEL (.IL)
ITALY (.IT)
JAPAN (.JP)
KOREA, REPUBLIC OF (.KR)
LATVIA (.LV)
LITHUANIA (.LT)
LUXEMBOURG (.LU)
MALAYSIA (.MY)
MEXICO (.MX)
MOZAMBIQUE (.MZ)
NETHERLANDS (.NL)
Networks (.NET)
NEW ZEALAND (.NZ)
NICARAGUA (.NI)
NORWAY (.NO)
Organizations (.ORG)
PAKISTAN (.PK)
PERU (.PE)
POLAND (.PL)
PORTUGAL (.PT)
ROMANIA (.RO)
RUSSIAN FEDERATION (.RU)
SAUDI ARABIA (.SA)
SINGAPORE (.SG)
SLOVAKIA(Slovak Republic) (.SK)
SLOVENIA (.SI)
SOUTH AFRICA (.ZA)
SPAIN (.ES)
SRI LANKA (.LK)
SWEDEN (.SE)
SWITZERLAND (.CH)
TAIWAN (.TW)
THAILAND (.TH)
TURKEY (.TR)
UKRAINE (.UA)
UNITED KINGDOM (.UK)
UNITED STATES (.US)
UNKONOWN (.???)
URUGUAY (.UY)
US Dept of Defense (.MIL)
US GOVERNMENT (.GOV)
VENEZUELA (.VE)

Site gets top rating!

I recently visited the very popular website at www.eHam.net. It is a great place to find out EVERYTHING you need to know about amateur radio. Besides the articles, discussion forums, classifieds, DX spots, callbook searching, ham related links, and surveys, eHam.net has a rating system for ham radio related sites and links. I'm happy to announce that the AWA website has been given a 5-star rating, the highest. This rating is from the visitors who have been to our site and not from the guys running eHam.net.

Chuck Schwark
AWA Web Administrator

other than return mailing cost. For info on loan conditions, to make reservations, or just inquire, contact Richard Ransley, P.O. Box 41, Sodus, NY 14551. The following are available:

VHS VIDEO PROGRAMS

V-2 — "Electrons on Parade." 18 min. 1938 movie made at RCA's Harrison Plant showing production lines with closeups showing receiving tubes, including a short sequence on transmitting tubes. (Very rare movie.)

V-4 — "The British Receiver." Documentary of the AWA/BVPS meet with visit to Marconi's Chelmsford plant, the British Science Museum, and ending with series of collectible British receivers. (VHS program transferred from slides.)

V-5 — "The Early Years." Historical documentary narrated by Clarence Tuska telling of the early years of amateur radio, founding of the ARRL and WW I military radio training school. (VHS program transferred from slides.)

V-6 — "The Key." History of the telegraph/radio key covering early hand keys, semi-automatics and commercial types. Script by Lou Moreau, W3WRE. (VHS program transferred from slides.)

V-9 — "The Transatlantic Tests and 1BCG." Rare documentary/photographs showing early amateur operation leading to famous 1921 transatlantic tests.

V-12 — "Those Wonderful Magazine Covers." The story of radio through magazine covers. Colorful with period music.

V-15 — "The WHAM Story." Details development of a pioneer radio station in Rochester, NY. Program developed with assistance and recollections of Art Kelly, the station's former general manager.

V-16 — "The Charles Herrold Story." Video prepared by Mike Adams who donated this copy to the AWA. It documents the work of broadcasting's Forgotten Father who started broadcasting in 1912.

SLIDE PROGRAMS

S-1 — "Portrait of a Pioneer." The life of Elmo Pickerill.

S-2 — "Polar Adventure." Pictures taken by Bud Waite and his narration describing numerous trips to the Antarctic over a 35-year period.

S-3 — "70 Years of Vacuum Tubes." Describes the history of vacuum tubes.

S-4 — "The Early Years." (See description for V-5.)

S-7 — "The Transatlantic Tests and 1BCG." (See description for V-9.)

S-8 — "Trip Through the AWA Museum" Covers exhibits and equipment.

S-12 — "The Key." (See description for V-6.)

AWA NETS

PHONE:

SUNDAY:

7244 kHz, SSB, noon (NCS:WA4IAM);
3837 kHz, AM 4 p.m. (E.S.T.), 4:30 p.m. (during E.D.S.T.) (NCSs:W2ZM & W2AN)

TUESDAY:
14274 kHz, SSB, 2:30 p.m. (NCSs KC3YE and W0FXY)
3837 kHz SSB, 8 p.m. (NCS WB2SYQ)

MONDAY-WEDNESDAY-FRIDAY:
3867 kHz, SSB, 9:30 a.m. (NCS: W2OBJ)

CW:

DAILY, 3588 or 9050 kHz, 4 p.m. Protocol, informal. Check both frequencies for activity and join in, or call AWA de (your call) and see What you stir up.

First **WEDNESDAY** of each month, 8 p.m., 7050 kHz

2-M REPEATER (Rochester Area)

MONDAY, 7:30 p.m. (NCS: K2GBR)
Receive 146.820 MHz
Transmit 146.220 MHz

LETTERS, *continued from page 6*

porary illustrations of Eimac tubes referenced there, in an 84-page publication of the Tube Collectors Association. The format is 5½" × 8½"; it is available as a package with the six issues of "Tube Collector" for the year 2000. Cost is $18.00. Order from the TCA at P.O. Box 1181, Medford, OR 97501. TCA membership for 2001 is $20. For info, readers may visit www.tubecollectors.org or contact Ludwell Sibley at 541-855-5207.

ALAN DOUGLAS
Pocasset, MA

NEW MARCONI BOOK

The Italian publisher Mosè Edizioni has released an elegantly printed, case bound, "bilingual" (Italian and English) volume to commemorate the 100th anniversary of the first wireless telegraphy link (between Cornovaglia and Newfoundland). *Epic History of Radio Story of One Man* is a collection of Marconi's technical work. Its more than 300 pictures show the birth and development of radio starting with the pioneers and following Marconi's work up to the time of his death. The 21.5 × 30 cm, gold leaf embossed, volume is being published in a limited edition of 550 copies. It is a little difficult to follow the pricing abbreviations in the somewhat confusing brochure, but the cost seems to be 130 Italian Lire (discounted to 104 if you are a subscriber—though I can't tell you what constitutes a subscriber). However, if you are interested in spending 130 Italian Lire (and that has to be a fair pile of money), you probably won't mind contacting the firm for more information. Mosè Edizioni, Via Bosco, 4-31010 Maser (TV), Italy; Phone 0039 0423 950385; Fax 0039 0423 529049; e-mail edimose@tin.it. There's a web site too: www.antiqueradio.it—but you have to know the language!

From a Press Release

BY DONALD F MCLEAN BSC(HONS) CENG FIEE

PLAYING BACK THE EARLIEST KNOWN VIDEO RECORDINGS

Discoveries have recently come to light that alter and enhance our view on what television was like right at its beginnings—a time when spinning discs and mirror-drums captured and displayed the first ephemeral television images. These discoveries have come from restoring the world's earliest-known recordings of television. The video recordings, captured on needle-in-the-groove 78 rpm gramophone discs, were made in Britain from 1927 onwards—fully 25 years before the first practical videotape recorder and nearly 50 years before the domestic videodisc player.

To understand the significance of these videodiscs, we need to see how they fit into the complex story of the technological development of television. At the risk of covering ground known to many readers, let me "fast rewind" to television's practical beginnings in the 19th century.

Television's Dawn

Spurred on by the discovery of the light sensitivity of selenium in 1873, the early pioneers of imaging systems demonstrated the communication of still pictures over cable in the late 19th century—without electronics. The advent of Fleming's thermionic diode valve in 1904 and De Forest's triode valve and amplifier of 1912 led the electronic revolution, essential for long distance imaging. By the early 1920s, news-picture "facsimiles" were spanning thousands of miles.

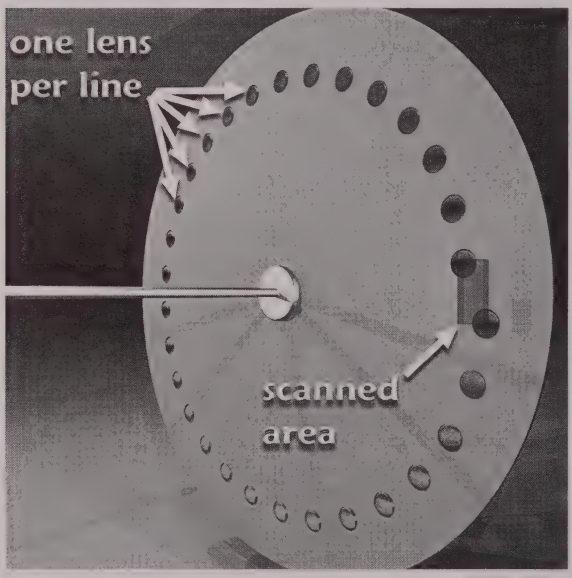

Fig 1. The Nipkow disc configured as a camera with a single spiral of 30 lenses. Each lens sweeps out the path for one line, one complete turn generates a frame. The area being scanned is highlighted.

In contrast to these slow, yet high quality transmissions, television required several pictures per second to give the perception of motion. The advantages offered by electron tubes for television camera and display were recognised (1908 [1], 1911 [2]) well before their practicality. The electron tube display first appeared in the 1920s and the practical electronic camera—a major technological challenge in itself—in the 1930s.

Several mostly independent pioneers around the world, including John Logie Baird in the UK and Charles Francis Jenkins in the United States, focused on achieving a practical television system by adapting what already existed to their purpose. They used the only method of capturing the scene available—mechanical scanning. Of the many methods developed for scanning, that of the Nipkow

CONTACT DON MCLEAN BY E-MAIL AT DFM@DIRCON.CO.UK

disc (Figure 1) became the most popular, supporting the development of the first practical television systems for a period of almost half a century after its initial patent [3].

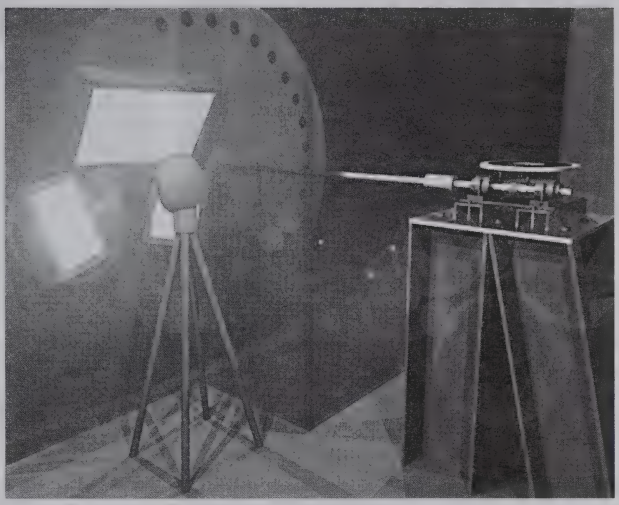

Fig 2. Simulation of Baird's laboratory deduced from photographs and the features of the Phonovision discs. A dummy head stands in front of floodlighting and faces the scanning aperture. The most likely position for the drive motor is between the scanning disc and the turntable.

Practical Television

The mechanical nature of Nipkow-disc-based systems, and the sensitivity and bandwidth of photocell-amplifiers initially constrained the television image to mere tens of lines rather than the hundreds of lines of the electronic systems emerging in the 1930s. In the 1920s Baird developed a format that was to become the broadcast standard of the BBC in the early 1930s. He used a picture format of 30 lines per picture refreshing 12.5 times per second. Line scanning was vertical, from bottom to top with picture scanning from right to left. Baird chose an aspect ratio of 3:7—a vertical letterbox, optimised for televising one person from close-up portrait to long-shots.

This low definition turned out to offer a distinct advantage. The highest vision frequency was so low that it was in the audio spectrum. Both this narrow bandwidth and the ease of creating different scanning arrangements were the main reasons why Baird was able to achieve so many "firsts," years before they were repeated in electronic television.

Inventions

Spurred on financially and technically by his early demonstrations, from 1926 to 1928 Baird patented and developed a series of innovations that covered almost every engineering aspect of television. He demonstrated colour television, stereoscopic television, (near) infrared, and long-distance transmission. In early 1928, he demonstrated reception of pictures across the Atlantic in Hartsdale, NY, from transmissions in Coulsdon in Surrey, England. In the months leading up to that event, he not only transmitted live images, but also his latest experiment, videodisc recordings [4]. These and other demonstrations served to raise awareness of a television revolution.

Today, little evidence remains of these early achievements. This makes it difficult to be factual about Baird's contribution to television—especially in his most publicised creative era of the late 1920s. Various interpretations of his works have both over- and under-stated Baird's importance. However, the significance of one of his achievements from that period has only recently been recognised. This is his recording of television—the first in the world.

Phonovision and the "Phonovisor"

In 1926, Baird applied for the first of a few patents on ideas for recording a television signal [5]. He called the process *Phonovision*. What made Phonovision unique was its mechanical coupling of the camera mechanism to the record platter (Figure 2). The same linkage on playback would have ensured a rock-steady picture from the disc. In one simple concept, Baird eliminated the effect of speed variation during recording and playback.

A subsequent patent [6] described the "Phonovisor" (Figure 3). This was to be a simple

All photos courtesy author except as noted.

Fig 3. A promotional mock-up of the "Phonovisor." The image would appear in the aperture to the left of the turntable. A single pickup arm would playback video and audio together in a manner patented by Baird that predates the 1931 stereo audio recording patent of Alan Blumlein.

Fig 4. Phonovision equipment at Baird's laboratories at Long Acre in London in early 1928. The floodlights have been blacked-out by ebonite sheets for Baird's television experiments in the near infra-red, which he called "Noctovision." Courtesy of Royal Television Society.

domestic machine used for playing back and showing pictures from the Phonovision discs. The Phonovisor would have looked like a conventional gramophone. However, mounted coaxially with the disc platter was a horizontal Nipkow disc with the apertures on the rim outside the disc platter.

Although highly innovative in its simplicity and inherently cheap, neither Phonovision discs nor the Phonovisor ever appeared commercially. Unlike Baird's other experiments, the reproduction of pictures from the Phonovision discs, though undoubtedly attempted in the laboratory (Figure 4), was never publicly demonstrated. From his own comments, it would seem that Baird was never sufficiently satisfied with the picture quality to give such a demonstration. Baird moved on to other ideas and abandoned Phonovision. He passed a few of the discs to museums [7] and to his friends and employees. Over the subsequent years, many people attempted reproduction of images from the Phonovision discs [8]. Their efforts yielded only distorted and unrecognisable patterns.

What Baird could not have realised is that more than sixty years later the faults during recording could be corrected in a personal computer, [9,10] restoring the latent image on his discs to a recognisable form. Those images give a remarkable insight into those pioneering days of television. The images though are only part of the discoveries made. Studying the details of the video signal tells us the camera type and even how well it was built. In addition, analysing the faults on the recordings gives a unique and in-depth understanding of the difficulties Baird encountered [11]. From previously being mere curiosities, the discs have today become one of Baird's most important legacies.

In the Phonovisor, Baird was attempting to build a domestic videodisc player and display system. Phonovisor development can be placed 25 years before the first practical videotape recorders. However, the first videotape recorders, made by Ampex Corporation, had a different purpose: they were used initially to time-shift broadcast programme transmission. It was not until the 1970s that the first domestic videodisc and videotape machines became available that shared the original purpose as thought out by Baird in 1926.

The 30-line Broadcasts

In September 1929, after much lobbying, the Baird Television Development Company started a series of experimental transmissions through

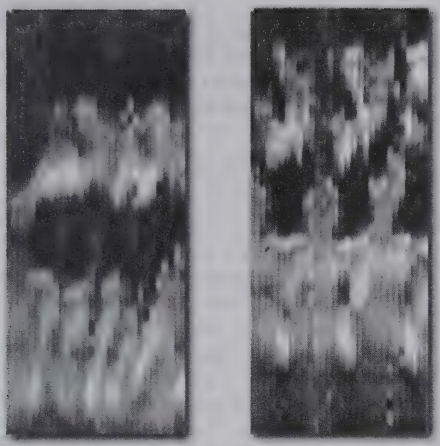

Fig 5. The Paramount Astoria Girls performing their high-kicking routine in long-shot on the amateur recording made on 21st April 1933. We can make out two dancers on the left and almost three on the right. Contemporary documents showed that the producer, Eustace Robb, vetoed an idea to have the dancers wearing white swimming costumes. We can now see why.

the BBC transmitters. For nearly three years, for no less than five times a week, the Baird Company produced its own programmes from its laboratories in Long Acre. In August 1932, the BBC took over full control and started the first BBC Television Service with regular programming from studio BB in the basement of Broadcasting House. The vision equipment was precision quality, professionally built, yet based on the by-then mature and fully developed 30-line system.

It now seems that a few of the enthusiasts watching the television programmes were moved to use their domestic audio recorders to record the vision signal for subsequent playback. Although the quality of the result would have seriously disappointed them, they very fortunately kept the discs safe rather than destroying them.

The Off-Air Recordings

In 1996, a privately recorded aluminium disc, with just the cryptic "Television 1933" written on the label, was discovered to contain the earliest-known recording of a television broadcast—in fact, a television special (Figure 5). Featuring the *Paramount Astoria Girls*, the recorded fragment was from the first television revue, broadcast on 21st April 1933, just eight months after the start of the BBC Television Service. The non-stop action on the disc overturns the established views on the 30-line BBC programmes of staid amateurish performances. The camera technique, lighting technique and production features are all unusual, unique and professional. The rapid pace of the performance is stunning and provides us today with our first true measure of television programme making in the early 1930s.

In early 1998, another discovery was made. A set of unmarked privately recorded aluminium discs contained high quality original 30-line vision recordings from the BBC's 30-line service. One of the singers on the discs is almost certainly Betty Bolton (Figure 6), who performed over a dozen times in front of the 30-line cameras. Her vision-only performance on disc, passionately singing a love song [12], is simply stunning. After 1,500 programmes, the BBC 30-line service closed on 11th September 1935. In November 1936, the BBC re-opened its Television Service with high definition television. The massive technology leap that television had made left recording technology far behind. It would be nearly twenty years before direct video recording could catch up.

Fig 6. Betty Bolton, star of vaudeville, theatre, dance bands, records, movies and radio, was the first performer to appear on the BBC's 30-line Television Service, 22nd August 1932. In this collage, she is viewing an image restored from disc. In reality she viewed these images in 1998, an event recorded for the inaugural programme of BBC Digital TV. Courtesy of Betty Bolton and the author.

Where are the Rest?

Given that mechanically scanned television was popular for a time not just in Britain, but also notably in the United States and Germany, it seems inconceivable that only British amateurs made off-air recordings. To date though, no further recordings have been found. The reason may be quite simply that in Britain magazine articles by Harry Barton Chapple encouraged amateurs to capture the video signal, even telling them how to do it. In the United States, there is one recorded instance of a vision signal being captured, and that was facsimile, not television [13]. Some Ediphone recordings were made of the Cooley Ray-Foto facsimile system broadcast for a few months in 1928-29 from station WOR.

Arguably the most influential corporate organisation in the United States was the RCA. At the time when experimental mechanical television programmes were being transmitted, RCA had already moved towards electronic television. Hence there would be no corporate interest from RCA in developing or experimenting with mechanical television recording [14]. The Bell Telephone Labs led the way in film recording of video with an announcement dated Feb 1929 [15]. Some telerecorded material still exists from 1930, although this was recorded at the General Electric "House of Magic" labs at Schenectady, NY.

Conclusion

Through an approach reminiscent of an archaeological dig, television pictures have been recovered and restored from the pioneering days of both John Logie Baird in the late 1920s and of the fledgling BBC Television Service in the early 1930s. Accompanying these historic images, there is now a new and far deeper understanding for Baird's experimental efforts and for what broadcast television was really like.

From the investigation into the faults on the Phonovision recordings, we can see the progression of Baird's attempts to solve the mechanical problems that thwarted the production of the world's first videodisc recorder and player. The imaging results alone from Baird's Phonovision and the recording fragments of BBC programmes have been hailed as amongst the most significant finds in television's engineering history.

A book by the author and published by the IEE describes this work in detail. Restoring Baird's Image *is available either directly from the US IEE distributor <http://www.iee.org.uk/publish/ordering/usorder.html > or through leading bookstores. It is priced at about $55 or less (ISBN 0 85296 795 0). The author's website at <http://www.dfm. dircon.co.uk > contains extensive information on the restored images together with sounds and video clips from all the restored discs.*

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[12] Bolton, Betty: Private communication with the Author, July 1998

[13] Biehl, M.: Private communication with the Author, 25th Jan 2000

[14] Magoun, A., Sarnoff Research Center: Private communication with the author, 24th Jan 2000

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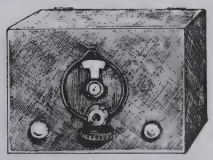
AMATEUR RADIO

EDITED BY **JOHN F. ROLLINS, W1FPZ**, HC 33, BOX 150, ARROWSIC, MAINE 04530
PLEASE INCLUDE SASE FOR REPLY.



1929 QSO Party Results — Annual OT DX Contest

By John Rollins, W1FPZ

The annual Bruce Kelley Memorial 1929 QSO Party for year 2000 was held during the first and second weekends of December. Conditions for both weekends appeared to be excellent across the country—a rare event, I gathered. For a second year we were blessed with no QRM from the RTTY contest which held forth just above our sub band segment.

We had a good turnout which also included a number of new participants—welcome to the realm of "real radio!"

Eddy, WE3CUI compiled a bit of statistical information on '29 transmitter types in current use, based on his 55 QSOs.

Hartley — 26 (or 47.2% of total) average input 7.6 watts
M.O.P.A. — 11 (or 20% of total) average input 8.6 watts
T.P.T.G. — 5 (or 9% of total) average input 6 watts
R.N.T.—5 (or 9% of total) average input 7 watts

The Hartley oscillator is still "king" with some mighty fine sounding signals. The M.O.P.A. or Master Oscillator Power Amplifier is definitely on the increase.

Bob Raide, W2ZM, once again captured first place in the listings with 70 QSOs. It's not hard to recognize the signal put out by his self-rectified, push-pull 45s. Good going, Bob. Dave, VE3BBN, was again second with 66 QSOs. Look out, Bob!

On a sad note, Fran Thisse, W2BJI/J37XC has become a Silent Key. See the comments written by Randy Haus, KB2PLW, in his announcement (below) of the upcoming OT DX Contest. "Cuz" will be missed by all of us.

Finally, once again I have to ask/plead with you guys to send in your log sheets promptly. As of this writing, December 29, only 52 logs have been received, and there were more than 70 participants. In order for our Editor to make his publishing deadline for the February *OTB* he must have my report by the end of December.

Best 73s, John

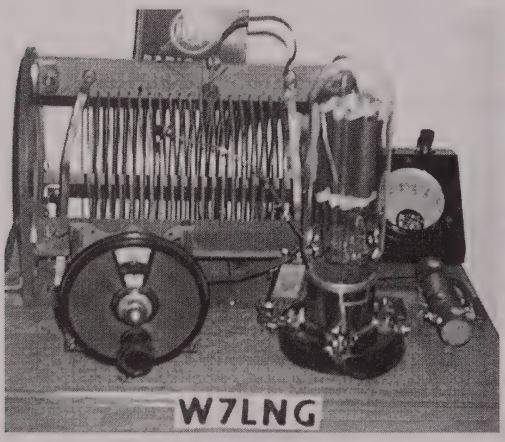
The Top Ten Scores

Call	Contacts	Call	Contacts
W2ZM	70	K3DZ	49
VE3BBN	66	N2VO	48
W2ZE	63	KITMJ	39
VE3CUI	55	NE1S	38
KJ8L	54	K4LJH	38
W2IRS	49		

Complete Participant List

	Call	Transmitter	Power	QSOs
W1	WIGIG	29 TPTG PP 45s	8W	14
	NE1S	29 TNT PP 45s	8W	38
	WIYT	29 Hartley	3W	32
	KA1CFQ	29 Hartley CX 350	10W	21
	WIDDW	29 Hartley UX 245	10W	26
	KITMJ	29 Hartley 10	9W	39
	WITSP	29 Hartley 45	4W	23
	WIFPZ	27 MOPA PR 210s	10W	14
W2	K2LP	29 TPTG 10	1W	22
	W2IRS	29 Hartley 203A	10W	49
	N2YR	29 Hartley		6
	W2AN	29 Hartley 10	9W	22
	W2LYH	29 Hartley 211	9W	28
	W2YIK	29 Hartley 45	7W	22
	W2DGB	29 Hartley 45	9W	12
	W2LDM	22 MOPA PR 202 & 204	10W	26
	W2ER	29 MOPA	10W	31
	K2KK	29 MOPA	3W	17
	N2TWW	27 TPTG 210	7W	34
	M2CDD	29 Hartley PR 27	7W	26
	KB2PLW	29 TNT 27	3W	22
	W2HBE	29 Hartley 45	10W	15
	N2VO	29 Hartley		48
	WB2SYQ	29 Hartley 27		23
	W2ZM	29 ACCW Hartley PR 45s	8W	70
	KE2O	29 TNT	5W	29
	W2ZE	29 TPTG	10W	63

	Call	Transmitter	Power	QSOs
W3	KD3OR	29 Hartley DeForest 510	10W	34
	K3DZ	29 MOPA 27-46	9W	49
	WB3HLH	29 TNT UX-210	9W	18
	W3FJJ	29 Hartley 45	7W	17
	W3VVS	29 Harley 210	9W	13
	W5WS/3	28 MOPA	9W	20
W4	K4LJH	29 Hartley 211	10W	38
	AA4RM	29 Hartley PR UX210	9W	8
W5	AC5AM	29 Hartley	20W	31
	K5RB	29 MOPA 210	10W	21
W6	K6TQ	29 TNT 210	10W	21
	W6DJX	29 TNT 10	10W	18
	W6TDP	29 Hartley	10W	5
W7	W7QQQ	29 TPTG PP 27s	10W	9
	W7LOG	29 TNT 45	10W	2
	W7LNG	25 Hartley 203A	10W/20W	21
	W7DRA	29 TNT PR 211	10W	7
W8	NI8G	29 TPTG	6W	33
	KJ8L	27 MOPA 27 OSC/PP27	10W	54
	K8JWR	29 MOPA 27/27	4W	34
W9	W9QZ	29 Hartley 27	5W	27
W0	AB0CW	29 Hartley 10	10W	15
	KB0ROB	29 Hartley 10	10W	14
VE	VE3BBN	29 Hartley	5W	66
	VE3CUI	29 MOPA 245/PR 245	10W	55



Bud Larson, W7LNG, sent this photo of his impressive copy of a 203A Hartley complete with 1925 period components.

The 2001 Linc Cundall Memorial OT DX Contest

A MEMORIAL TO LINC CUNDALL W2LC

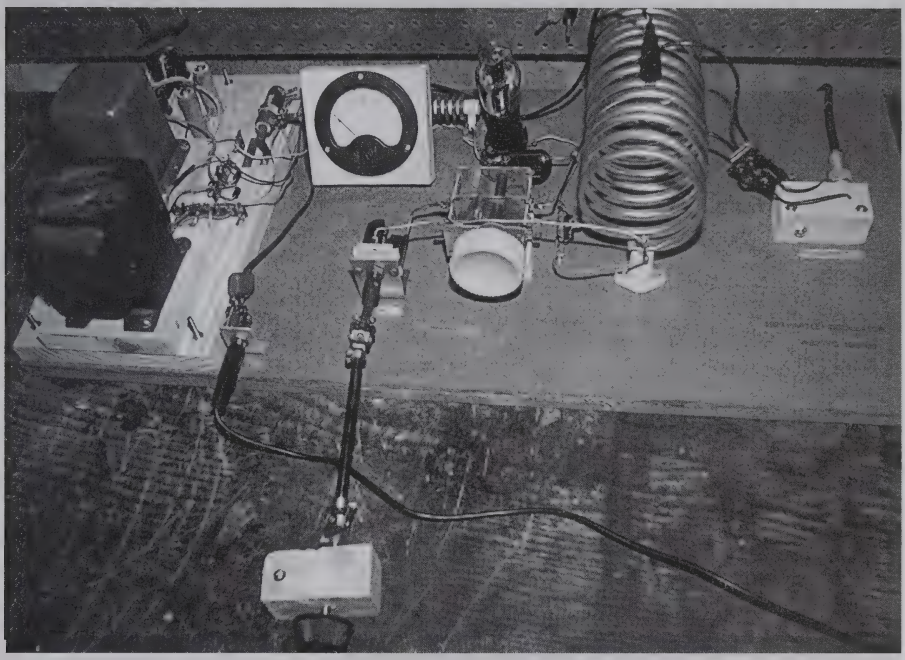
By Randy Haus, KB2PLW

The annual OT DX Contest will take place in April, 2001. This contest, held on 40 and 20 meters, gives the West Coast and DX Old Time operators a chance to compete on even terms. As of this writing, there are no contests scheduled for the dates posted below. The 2000 OT DX contest was a great success, with participation nearly doubled over previous years. I believe that we have finally hit upon the right combination of frequencies and scoring methods to make this contest a fun and popular event. Again, equipment or circuits designed before 1960 will be counted as OT gear in scoring. This encourages the building of many excellent circuits that are to be found in the 1950s handbooks and periodicals.

For the last half hour, I have been struggling with how to begin this next part. I was working Bob Raide, W2ZM, during the 1929 QSO party, when he told me that Fran Thisse W2BJI/J37XC had passed on several days before. For several minutes after that, I just stared at my receiver, listening to the grunts and yoops of the Hartleys, TNTs and MOPAs that filled the airwaves. Somehow, it was extremely befitting that I should learn of Fran's death by radiotelegraph. Fran was one of the first people that I met in amateur radio and the AWA. Each time that I attended a hamfest, or the Fall conference, I would immediately look for Fran's huge blue sedan, sagging with electronic treasures. For me, no AWA contest was ever complete without working "Cuz" from his winter home in Grenada. Fran was a jewel of a person to be around, always full of fun and good advice.

In my shack, I have a "wall of honor." On it, there are QSL cards from Ralph (Tommy) Thomas, W2UK and Herb Snell, W2FCH, letters from Bruce Kelley, W2ICE, and a host of other mementos from the great people who make up the spirit of my station. Now, I have a special section for the, "Ether Buster of Lowville" as his 1930 card proclaims. If I am lucky enough to get to heaven, I probably won't make it to the gate. I will be out in the parking lot, looking for a huge blue, sagging sedan.

If you don't receive an OT DX Contest Log by April 1st, 2001, please write to Randy Haus KB2PLW, P.O. Box 665,



Norm, WB2SYQ, built his '29 Hartley using a type 27 tube. Note the extension shaft on the bandspread capacitor—designed to minimize hand capacitance effects when tuning.

303 Pennsylvania Avenue, Trumansburg, NY 14886.

• *Dates and Times:* 2200UTC Wednesday to 2200UTC Thursday (April 18-19) and 2200UTC Saturday to 2200UTC Sunday (April 21-22).

• *Objective:* Contact the greatest number of AWA members. When calling, use "AWA AWA AWA de KB2PLW," as an example. Once contact is made, exchange year of equipment such as "TX 55" for a 1955 transmitter and "RX 38" for a 1938 receiver. Send "MOD" for 1960 or later gear.

• *Rules:* A station will be scored only once on each band. Non-member contacts and stations not submitting logs will not count.

• *Frequencies:* 7030-7050 kHz and 14050-14075 kHz, +/- QRM.

• *Scoring:* QSO Zones: "E" eastern zone, US Districts 1, 2, 3, 4, 8, 9, plus VE1, VE2, VE3; "W" western zone, US Districts 5, 6, 7, 0 plus VE4, VE5, VE6 & VE7; "DX" zone, all others.

• *QSO points per contact by zone:* "E" to "E" or "W" to "W": 1 point; "E" to "W" or "W" to "E": 2 points; "E," "W," or "DX" to "DX": 3 points

• *Equipment Multipliers:* Mod TX and RX: 1 point; OT TX or RX: 2 points; OT TX and RX: 3 points

• *Power multipliers (input to final):* 0-4.9 watts: 4 points; 5-24.9 watts: 3 points; 25-100 watts: 2 points; 100+ watts 1 point

• *Determining total points per QSO:* (1) Find the QSO points for the contact. (2) QSO points × your equipment multiplier × your power multiplier = total points for the contact.

• Scoring examples: **Example 1**, W3VVS contacts W1FPZ. (a) both are in the "E" zone for 1 QSO point; (b) both have OT TX and RX for a 3 multiplier; (c) both are operating at 10 watts for a 3 multiplier. Therefore, the contact is worth $1 \times 3 \times 3 = 9$ points for each operator. **Example 2**, K6TQ contacts W2ER; (a) "W" to "E" contact for 2 QSO points; (b) K6TQ has OT RX and OT TX with 20 watts; (c) W2ER has MOD RX and OT TX running 50 watts. Therefore the contact is worth $2 \times 3 \times 3 = 18$ points for K6TQ and $2 \times 2 \times 2 = 8$ points for W2ER.

• *Awards:* Plaques will be given out at the AWA Conference in September.

• *Logs:* Log sheets will be sent out to previous OT contest participants. Assuming that the list may have some omissions (or if you are a first time OT contest entrant), please write to me if you do not receive a log sheet by April 1st, 2001. Send logs by June 1st to Randy Haus KB2PLW at the address listed above.

BY CHARLES C. KIRSTEN
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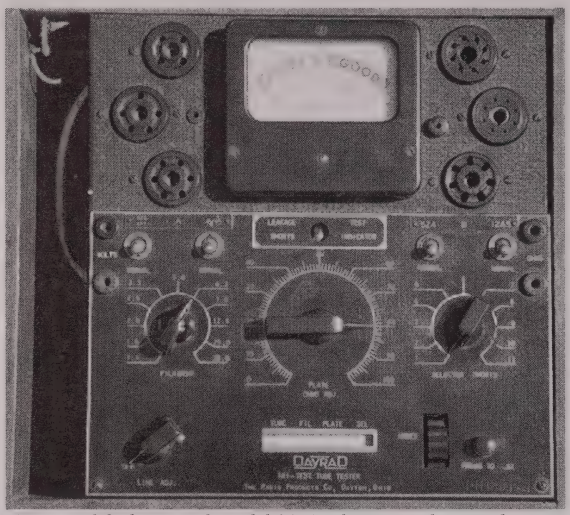
"OBSOLETING" A VINTAGE TUBE TESTER

Many early tube types were used for such a short period, and obsoleted so quickly, that they were never provided for in the tube testers of their time. As a result, I have a variety of "pre-octal" and "pre-UX" tubes which need to be tested, but which don't fit into any of my available instruments. It is quite a chore to set up an adapter or a special lead arrangement to make connections to old tubes with non-standard bases, and perhaps with filament connections brought out to the top or sides of the base.



An unmodified DayRad Model 20-A. This is not the unit that was actually modified, but another example from my collection.

I finally resolved to modify a tube tester specifically to fit old tubes, and I was willing to sacrifice one of my testers to do it. The one I chose to honor, a DayRad Model 20-A by Radio Products Co., is a simple emission tester made for tubes from the UX 4-pin up to the first octal and loctal types. It was selected not only because it wasn't too useful, but also because it offered a number of nice features.

The DayRad has a small solid walnut portable case with a separate compartment for the AC cord and other leads, a 1.1 filament voltage setting (not seen on many later testers), and a limited number of control settings (three), which was all I needed for the 4- to 7-pin tubes that I planned to add to the tester. Finally, there was cute little illuminated roll chart on 2½-inch adding machine paper, which I could duplicate for making new charts.

The unit was called a "Tri-Tester" because it also included pin jacks for "volts" and "ohms" tests. It had a mystery power transformer and I could find no diagram, so I had to trace the circuit. There were a few surprises. Among them was the fact that the transformer was actually an "autotransformer," i.e. the primary is internally connected to the secondary. This makes the circuit "hot" to the AC power line. Another disappointment was that the '37 tube inside the case, used only as a meter rectifier to measure the AC line voltage, required a 20-30 second warm-up before the line voltage could be adjusted.

In reviewing a number of small tube testers of the same thirties vintage, I found that major manufacturers like Weston and Radio City Products had also taken advantage of the low weight and small size of the autotransformer. This is not a big deal if you don't test tubes in the bathtub, but it does warrant care in use.

One nice surprise was that all the filament

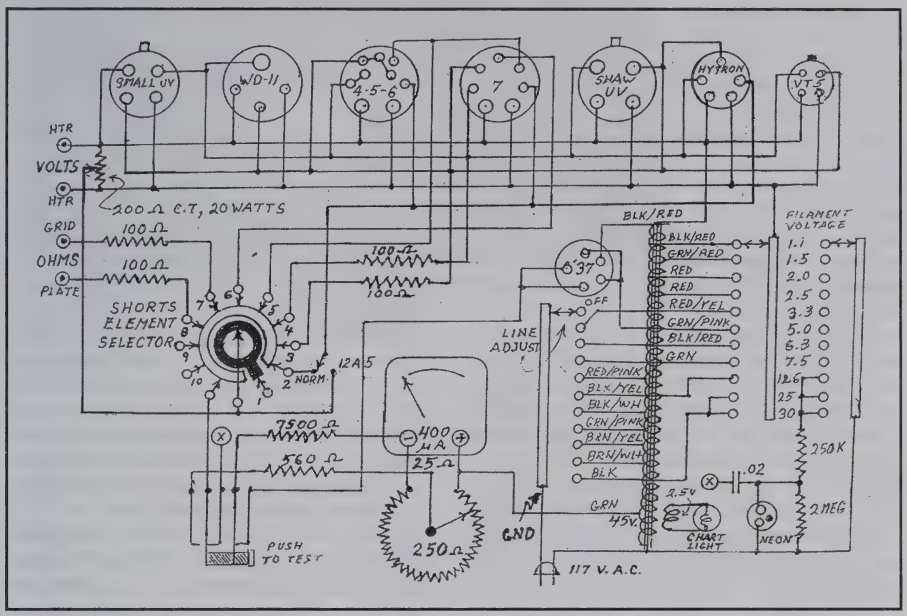


Fig. 1: Schematic of the 20-A as modified.

voltages (except the 7.5 volt setting for thoriated tungsten filament types 10 and 50), had been designed more than 10% low. That meant that if a tube passes the conservative emission test on this tester, not only is the cathode good, but it is likely to run for some time to come. The circuit for the tester as modified is shown as Fig. 1. No changes were made in the circuits for emission and shorts tests, so changing of socket types in the tester was a no-brainer. All of the Volt and Ohmmeter measurement circuits were removed, leaving the pin jacks to be used as explained below.

Since no octal or later type tubes were to be accommodated, the toggle switches for special tubes were disconnected. The 4- , 5- and, 6-pin, octal, and loctal sockets were removed from the tester, and a hole punch was used to enlarge the loctal socket hole to $1\frac{1}{2}$ inches for a large Federal UV socket. Finally, a carefully-positioned $\frac{7}{8}$-inch hole was added left of the meter to accommodate a Hytron miniature socket.

In the reconfigured tube socket panel. All sockets were wired pin-for-pin to the 7-pin socket, which was left in place. Starting at the lower left, and going clockwise, the sockets are:

1. Weston style UX4-UY5-6 pin combination socket—which replaced the individual 4-, 5- and 6-pin sockets I had removed.

2. Small UV bayonet socket for UV99, CECO "B", and Sodions.

3. SMK 5 pin socket for Hytron, and Hyvac miniature tubes.

4. WD-11 socket (one large plate pin).

5. W.E. 215A miniature bayonet socket ("N" peanut valve).

6. Large Federal bayonet UV socket for short pins like UV-01A.

7. Seven-pin socket (left in place).

All sockets matched the existing mounting screw holes, except the Hytron (the W.E. 215-A socket is held into the panel by long screws through a phenolic holding strip beneath the socket).

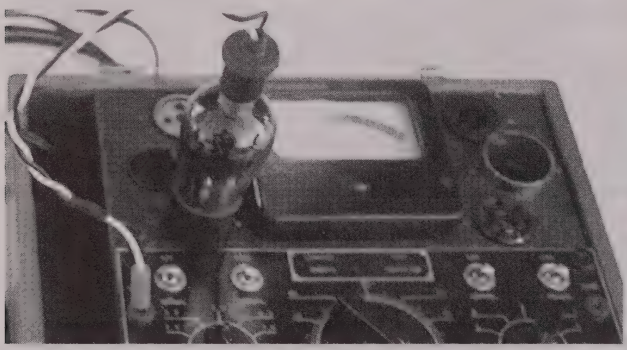
To provide the grid and plate connectors, respectively, for the tops or sides of tubes, the black and red "ohms" pin jacks on the right side of the panel were each connected through 100 Ohm limiter resistors to the seventh and eighth taps on the selector switch. To accommodate special heater connections to tube caps, bases, etc, I rewired the two "volts" pin jacks on the left edge of the panel to the tester's tube filament line.

I made up a number of plug-in leads to fit these jacks and having various terminations, including a pair of alligator clips, to faciliate quick connections.

I now went about revising the roll chart. Since the circuitry for emission tests was left unchanged, the settings for the 170 tube types already listed on the old roll chart were still valid. (The few loctal and octal tubes listed would not be included in the revised chart because there were no longer sockets to test them.)

The tube socket panel of the DayRad after modification was completed.

The list of obsolete types I assembled added up to almost 600 tube designations, filling 6 double-column pages when printed out. The tubes selected for the list were all the older UV and UY types, most 6- and 7-pin receiving types, and early alternating-current heater types. No tubes requiring special socket pin switching for filaments, or multiple types, were included. Also not included were cold-cathode tubes such as the BH and similar gas rectifiers, since the 45-volt test voltage is too low to ionize those tubes. Similarly, 4.0-volt import tubes were left out, since the tester filament settings did not include 4 volts.



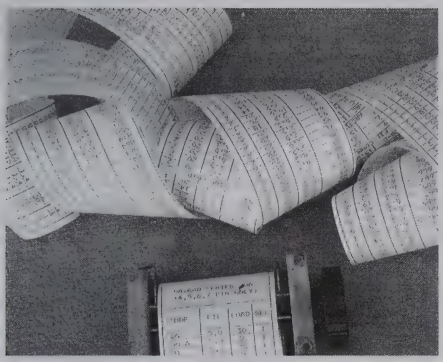
The modified DayRad being used to test an RCA Type 225. Picked up at an estate sale, this very rare prototype of the '27 has a 4-pin UX base with the filament leads brought out to an auto lamp base at the top.

Test settings for the unusual tubes were derived from a number of tube data sources, often by identifying electronically equivalent standard types whose settings were already on the roll chart. The revised list was sorted, verified and printed in both roll chart and data sheet format. I printed it by threading the free end of the adding machine roll into a platen-feed impact printer. I had misgivings about being able to fit a chart four times longer than the old one on the little rolls, but to my surprise it fit handily, and turned freely. The chart back-light was upgraded by replacing the rubber grommet holding the bulb with a standard pilot light fixture.

The operation of the DayRad is straightforward. The instruction sheet describes the operation in about three paragraphs. The point where caution should be observed is in setting the filament voltage. The long list of obscure tube types I researched for the roll chart has been very helpful in this regard. Many tubes included in the proliferation of types from this era have the same "number" but entirely different characteristics.

For example, a '22 tetrode with a grid cap may have: a 3.3 volt DC filament (RCA UX222, Cunningham CX222, CeCo RF22, etc); a 15-volt AC heater (Arcturus 22); a 2.25-volt AC heater (CeCo AC-22); or a 2.5-volt AC heater (Sonotron X222AC, Arcturus AC22). It is difficult enough to determine a tube's ratings when the label is clear, but it is next to impossible if the markings are missing, or illegible. With such uncertainty in even the listed ratings, it is wise to approach the testing of each unknown tube with some caution.

It never hurts to preset the filament voltage at the low end and press the "TEST" button while advancing the filament voltage by slow steps up to the stated rating. For example, if the apparent filament voltage is 5.0 volts, and the tube is showing full emission at 1.5 volts, it may have



The 12-foot revised roll chart both in loose form and installed in its holder (below).

been misidentified and 5 volts might burn it out. Of course, such precautions are not necessary where the tube type is well known.

In use, I have been very pleased with the antique tube tester. Its compact size and light weight make it easily portable; the simplicity of settings, and comprehensive list of tubes on the illuminated roll chart, make it fast, and almost effortless to use. When I finish testing, it holds all of the leads, including the power cord, and is easy to whisk out of the way. The instrument seems to be conservative in telling the good tubes from the bad ones, finding "doubtful," or "low," several which were 'good' on my Hickock 539C...no doubt because of the low heater voltage of the DayRad.

In a few cases. the Hickok could detect grid leakage which was not observable on the DayRad. The DayRad can't test multi-function tubes, so I use it to test only diodes, triodes, tetrodes, and pentodes, leaving the more complicated tubes to be tested by more complex testers.

Because of its simplicity, the modified instrument has made the testing of the early tubes a pleasantly easy task instead of a knob-twisting chore. No longer do I put off testing tubes "because it's too much trouble to set up a tester with adapters for just a few tubes." It is almost bizarre to think that, by making the little DayRad tube tester even more "obsolete," I have taken it from a dusty place on the shelf, and extended its appeal and useful life up past the year 2000.

Contact the author if you are interested in obtaining the original schematic, operating instructions, and settings or roll chart information.

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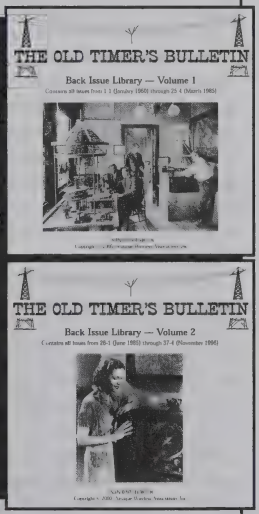

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THE VACUUM TUBE

EDITED BY **LUDWELL A. SIBLEY**, 102 MCDONOUGH RD., GOLD HILL, OR 97525-9626

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"Twin Tetrode"—The Eimac X159 Family

The Eitel-McCullough Company ran throughout World War II making transmitting triodes on a three-shift basis. However, they also found time to develop a line of tetrodes that would later "save the company" by obsoleting the huge wave of triodes that the Government released onto the market as war surplus. A variety of types were tried and abandoned, like a tetrode version of the familiar 450T triode. However, commercial success came with the well known 4-65, 4-125A, and 4-250A.

One of Eimac's wartime developments that did not become commercial was a family of twin tetrodes. The photo—from the Perham Foundation's Eimac Archive—depicts the X159. It obviously shares parts with the 4-125A (the plate design and the multi-bar "cage" grid) but has a seven-pin base. A few of these, and of variants, are found today in tube collections. Because these will be "whatzits" when they turn up, it may be helpful to go into the details.

This tube may have been pointed toward the mobile-radio market, as the filaments run on 6.3 volts at a total of 3.85 amps. (The filaments themselves were the same as used in Eimac's 3C24 triode.) It was rated at a dissipation of 35 watts per side. The Perham material lists numerous variants. There were even two twin *triodes* based on 3C24 elements but housed in the X159 bulb and base. The line ran as follows:

X159: Basic type; 0.007" wire on both grids; 14-bar grids
X160: X159 with tungsten-coated plates
X175: X159 with 0.005" control-grid wire
X196: X159 with 0.005" wire on both grids; 12-bar grids
X199: "Twin 3C24," X159 format, 3C24 parts, with grids tied together
X253: X196 with 0.007" wire on screen (simi lar to X175)
X254: X196 without screen shield; screen leads tied together
X284: Same as X175 except 0.011" wire on screen
X285: X254 but with screen leads not strapped together
X313: "Twin 3C24" for grounded-grid use, 3C24 parts, with grids strapped together on Kovar header
X371: X253 with plate pins out side of bulb opposite grid pins [common screen lead]
X374: X253 with plate pins out side of bulb above grid pins [common screen lead]
X375: X374 with 0.011" screen wire
X391: X375 "with screen can mounted on screen leads"

These variants were all logged as "completed" between April 1944 and July 1945. The X371 and above were made in the Salt Lake City plant, as opposed to the San Bruno (CA) location. Typical of Eimac practice of the time, the anode is of five-mil tantalum sheet; the grids, of tantalum wire.

A test report from August 1944 covers tests on the X159 and X196. Both could put out 280 watts in push-pull Class C operation while dissipating the rated 70 watts, but the X196 was easier to drive. The files also hint that one of the dual tetrodes was tried out in December 1944 by "Link" (presumably the Fred M. Link Co., pioneer mobile-radio maker) as a tripler giving 400-MHz output. The files also detail test results taken by Eimac on a 150-MHz amplifier using either the X159 or X160, on 15-MHz amplifiers, etc.

The "peek-a-boo" plate (Eimac's term) is familiar from many of their tubes of this vintage. The little ports at the top had the obvious feature of letting the tube assembler assure that the plate was centered on the grid while completing the plate seal. But the design had some subtleties to it as well.

In a tube like this, it is undesirable for much heat to flow up the support rod into the top seal: it stresses the seal thermally and electrically. These effects can lead to electrolysis of the glass and eventual air leakage. So the constricted metal cross-section where the top "hats" join the main anode forces much of the heat to stay in the latter and be radiated.

Additionally: in tubes with filaments supported only at the bottom, like these, the top of

the filament tends to run a bit hotter than its lower part. The little openings in the plate allow a bit of extra heat radiation from the filament, thus equalizing the temperature at the filament top.

The development files do not say why the twin tetrode was not introduced commercially. Perhaps it was too expensive to make; perhaps it would have taken too much attention away from the postwar single tetrodes, which were probably an easier "sell" to the industry.

An RCA Sampler'

The Dowd-RCA Archive, as has been said previously, contains the Harrison plant's "recipes" for making receiving tubes (and prewar transmitting types as well). For a given type, the documentation often runs to a couple of dozen pages, including electrical specifications, an outline drawing, figures showing the individual parts and complete "stem" assembly, specifications for setting the burners on the sealex (SEAL-EXhaust) machine and pumping the tube, instructions for aging and branding the completed product, etc. Popular/long-running tubes underwent continuous revision in one detail or another, so the Type 10, for example, is covered by 120+ sheets of material once all the various vintages are figured in.

A package of this material ("How to Make a 245") was handed out in the tube session at Rochester last fall, and has drawn requests for information on other vintage tubes. Since this may be of general interest, a package is now available. It provides a "snapshot" of 1929-34 vintage specs for the 201A, 245, 10, and 50.

Partial information is included on the A236A, RCA's design of the Army VT-52, including the most important part, the Master Specification Sheet. (The package in the Archive is complete, but some of the drawings are in large blueprint form, not amenable to copying.) Likewise, the "MSS" and a few other sheets are included on the A181, which became the original "single-plate"/20-filament 2A3. (It too is not fully reproducible.)

This selection represents triodes that are, of course, treasured in the antique-radio and tube-audio communities. The vintage is important because in later years RCA abandoned high-grade line drawings in favor of mimeographed figures. It also gave up unified packages on a given tube in favor of dispersing the drawings: the plate is documented in one of many binders covering plates exclusively, while the grid, getter, filament, etc. are similarly scattered. Hopefully, presenting one package will make unnecessary to "churn" 70-years-old material in future.

The X159 (from the Perham Foundation's Eimac Archive).

Also included are color copies of the Standardizing Notices on four eight-inch RCA and Cunningham crate labels of 1928-33 vintage. The RCA ones, in two versions, are in red and black; the Cunningham labels are in blue and orange. These have potential as wall decorations, etc.

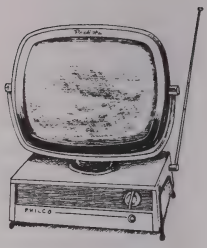
What with the color copies, the cost to get these 75-page packages copied and mailed first-class comes out to $8.00. They are orderable from (checks payable to) Ludwell Sibley at 102 McDonough Rd., Gold Hill, OR 97525. This offer holds throughout 2001. Outside North America, please add another $3 for postage.

It is unlikely that anyone will be making 201As in his basement from this material; however, it certainly gives insight into how tubes were made and what's in the Dowd Archive. One quirk pops out from the drawings: on ALL big-pin tubes, per the numbering plan originally used by GE and RCA, the large filament/heater pins are always numbered "3" and "4"! This holds for 4-, 5-, 6-, and 7-pin bases. That scheme

(continued on page 28)

TELEVISION

EDITED BY **RICHARD BREWSTER**, 145 LITTLE PECONIC BAY ROAD, CUTCHOGUE, NY 11935 *PLEASE INCLUDE SASE FOR REPLY.*



Educational Television in the 1930s

The November issue of this column described a mechanical television receiver that figured prominently in the early efforts to establish an educational television service. In August of 1931, the State University of Iowa set up a closed circuit television demonstration at the University's State Fair display. The lab-built equipment consisted of mechanical scanning transmitter and receiver units which were in operation for twelve hours each day! The display, entitled "The Eyes of Tomorrow," was operated by the University's electrical engineering department.

In an August 28 article, the *Des Moines Tribune* referred to the display as "A glimpse into the future." Interest generated by the fair display encouraged the electrical engineering department instructor J.L. Potter to proceed to develop a broadcast system at the University. This, too, was reported in a newspaper account (*The Daily Iowan* for November 10, 1931).

The University acquired a commercially built Western Television mechanical set and observed the programs transmitted by the Chicago Daily News station, W9XAP. The president of Western Television Corporation, Clement F. Wade, was a State University of Iowa graduate. He heard of the work being done at the University and determined that his alma mater should be encouraged to continue their work in the television field. This resulted in a gift to the school of necessary equipment to proceed with their experiments. A construction permit was issued on the 8th of January, 1932 for up to 100 watts power on a frequency between 2 and 3 MHz.

The broadcasting license was granted and on May 27, 1932, the call letters, W9XK were assigned. It was the first university to hold a full time visual broadcasting license. (Wireless transmission was nothing new at the State University of Iowa, in fact they first went on the air in 1911.) The FCC application stated that one of the purposes of the license would be to evaluate "visual broadcasting as a supplement to sound broadcast of an educational nature."

The broadcasting studio was on the ground floor of the electrical engineering building on the campus. The camera consisted of a 1000 watt projector light source broken into moving spots of light by a triple-spiral disc consisting of 15 holes each, rotating at 900 rpm. This system, which produced a triple-interlaced image of 45 lines, was developed by Sanabria. It reduced flicker considerably, and in fact, is used in modern TV as "double interlacing." The result was a 45 line system with an apparent frame rate of 45 per second.

Watching State U. of Iowa experimental TV on an Echophone 41 tuned to W9XK and picking up only the picture. The conventional broadcast receiver under the TV set picked up the sound from university station WSUI.

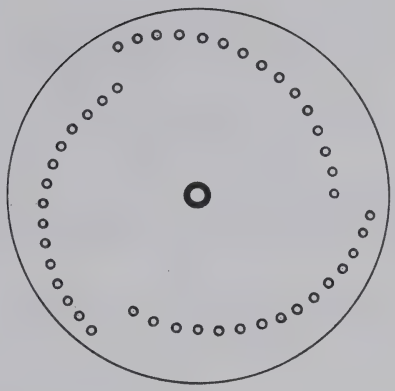
The "flying spot" could be focused on the object to be scanned by any one of three lenses; a wide angle lens for full-length action shots, an intermediate for head and shoulders, and a close-up for letter-size papers. The wide angle was not used due to the lack of detail in the image. The lens system was aimed through the center of a "photo-cell box" containing 10 large cells. The cell box separated the camera room from the actual studio, which was kept dark except for a small source of light.

The transmitter was reported to consist of a Hartley oscillator operating on 2050 kHz driving a power amplifier having an output power of 50 watts. Accompanying sound was provided by the university broadcast station, WSUI, operating on 880 kHz. Disc synchronization was accomplished by operating the receiver discs on the same power grid as that of the transmitter. This allowed a major portion of the state of Iowa to receive synchronized visual broadcasts. Viewers in other locations had to maintain synchronization by manually controlling the speed of the motor.

The first formal broadcast took place on the 25th of January, 1933 at 7:15 PM. It consisted of an illustrated lecture depicting the "old capitol dome," a bar graph chart, a violin solo, a lesson in sketching and a scene from a play. *The Daily Iowan* described the receiving set as....

> *"...shaped similar to portable radio receivers. Instead of the built-in loud speaker, the television receiver is equipped with a ground-glass plate four inches square upon which the image is thrown. The images appear in black against the reddish background of the plate."*

Screen image of W9XK's transmitted station ID.



45-hole scanning disc as used in transmissions from W9XK.

A photo on page 139 of "Pioneering in Educational Television 1932 to 1939" confirms that this is indeed the Echophone model 41 discussed in the November, 2000 column! Between the years 1932 and 1939, almost 400 programs were broadcast on such subjects as oral hygiene—the correct method of brushing one's teeth, identifying tree leaves, lip and tongue movement in French pronunciation, and shorthand symbols. Each of the telecasts also contained both musical and dramatic presentations.

A reception report from W9AYX (60 miles distant) stated that on Sunday, January 17th, 1934...

> *"...the call letters and the young lady and the man were very clear. The main program showed the subjects very visible at all times, but hazy and double at times."*

On the 21st of March, the same viewer commented...

> *"...We received the picture through bad local noise. Picture of Lincoln was best we have seen of sketching so far; very recognizable."*

Another viewer in Duncan, Oklahoma wrote that. . .

> *"...at times the picture was very clear, in fact, details were brought out to such an extent that it was easy to see even movement of the eyes, lips, and head."*

A 13 year-old boy in Chicago wrote...

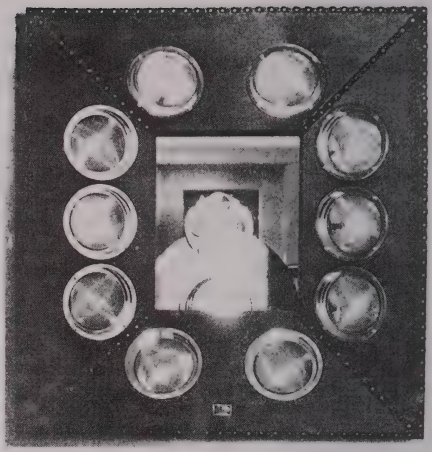
> *"...By looking at your transmission I be-*

lieve that television transmitted this way is very practical. My receiver is an 8 tube Crosley specially adapted to a Western Television unit using a vertical glow tube, scanning disc arrangement."

Other reports of reception came from as far away as New York City. *The Literary Digest* for July 15, 1933, in an article about the University of Iowa station, noted that...

"...Television appears to be definitely on the road now to become an educational instrument of practical value."

In the late 1930s the University was experimenting with electronic television as well, but surely the work done at this facility must be considered true pioneering in educational television.



Lens system is visible through opening in the 10-cell "photo-cell box" (see text).

VACUUM TUBE, *continued from page 25*

was promoted to the public: if you have the RC-11 tube manual of 1933, take a look at the pin-numbering on Page 150.

The OTB on CD-ROM

Now that the first 37 years of *The OTB* are available on CD-ROM, an awful lot of classic tube literature is once again available. Many of the articles are "the definitive word" in their area, like Bill Condon's comprehensive writeups on De Forest DV-DL and Moorhead tubes. Many write-ups cover topics that are only partially addressed, or not covered at all, in the usual books on tube history. Listed in terms of volume-number-page, here are some particular examples:

"Albert W. Hull's Kenopliotron: Born Too Soon?" (Lauren Peckham) 31-3-7
"Dr. H. J. van der Bijl and the Vacuum Tube" (Dirk Vermeulen) 30-2-34
"'Expanse B' and Other Early Australian Valves" (Fin Stewart) 8-2-13
"GE's 12B7 Blue-Metal Loctal Tube" (Bro. Patrick Dowd) 37-4-33
"German WW II Magnetrons" (Jerry Vanicek) 35-1-38
"History and Development of the All-Metal Radio Tube" (Bro. Patrick Dowd) 33-2-22
"How Did De Forest Invent the Audion?" (Lloyd Espenschied) 31-3-9
"Loewe Valves Revisited" (Pat Leggatt) 32-2-21
"Majestic and the Spray-Shield Tube" (Ludwell Sibley) 32-2-15
"Moorhead and the Electron Relay" (William Condon) 9-3-12 + 29-4-14
"Rejuvenation of Vacuum Tubes" (Lane Upton) 14-3-20
"Speed 'Triple-Twin' Tubes" (Gerald Tyne) 15-4-12
"The 'Original Nine' Metal Tubes and the Forgotten 6D5" (Ludwell Sibley) 32-4-11
"The De Forest DL-DV Series" (William Condon) 23-4-12
"The De Forest Spherical Amplifier" (Jerry Vanicek) 33-3-26
"The Eimac Story" (William Orr) 12-3-20
"The G & R Valve Company" (Colin MacKinnon) 35-3-42
"The Laboratory Oscillion" (Lauren Peckham) 29-3-15
"The Schickerling Tube" (Alan Douglas) 27-1-20
"The Van Horne Tube Company" (Jim Cross) 35-2-8
"Tune-A-Lite/Tonebeam/Tuneon" (Bruce Kelley/Philip Taylor / Ludwell Sibley) 30-4-17 + 31-1-33 + 31-4-27

There was even a special issue devoted to tubes: Vol. 31 No. 3.

An electronic format can never replace the original in terms of "look and feel," particularly when covers that were originally in color come out as black-and-white. Still, the CD-ROM is a valuable research resource, and is strongly recommended for those whose libraries lack the early issues.

THE *AWA REVIEW* VOLUME 13 IS NOW AVAILABLE

The Antique Wireless Association presents for your reading interest a new volume of *The AWA Review*, with some unusual content.

The lead article is by well-known Canadian member Robert Murray, who explores in depth the Canadian Northern Electric manufacturing company and its radio products. The detailed listings and numerous photos should prove to be of considerable interest to the radio collectors and historians, especially to those who may not have known much about the products of this rarely-mentioned company.

Graeme Bartram of Australia, a relative newcomer to our pages, recounts a little-known legal case that led to the commercial dominance of the Marconi Company in the field of wireless telegraphic communications for many years. He also introduces us to another radio pioneer, John Graeme Balsillie. A key element within the story is the famous Marconi 7777 patent.

Next, Bart Lee, a well-known historian and writer, continues with the Marconi theme by exploring in depth the controversial "three dots" first message from England to Newfoundland on December 12, 1901. While writers over the years have cast doubts on the veracity of the Marconi claim, this paper draws on some little known sources to place this historic event in better perspective, and in the process, provide us with some very interesting reading.

Richard Foster of Cochituate, Mass., and Pierre Demerseman of Paris, France, have joined forces to produce a discussion of radio direction finding, and "Huff-Duff." This World War II secret weapon played a vital role in the Battle of the Atlantic, and was instrumental in reversing the very serious situation in favor of the Allies. Coupled with a history of radio direction finding, the authors explore the significant work of French engineer Henri Busignies, including details of his related patents.

Writer Pamela Grundy, of Charlotte, NC, who is well known to the members of the AWA Carolinas Chapter for her interest in early radio, has offered for our reading pleasure the early history of Charlotte's radio station WBT. The challenges facing the early radio station pioneers as the industry developed are reflected in this lively tale.

Following through on early radio stations, George Freeman, well known within AWA circles, tries his hand at authorship by exploring the theme of just how these pioneer stations came into being in the fledgling industry, and how some survived while many did not. Appended is a comprehensive list of these early stations, which, the author assures us, is still developing.

The AWA Review Volume 13 is available now for US$19.95, postage paid in U.S. and Canada, by writing to: AWA Museum, 187 Lighthouse Rd., Hilton, NY 14468. Overseas orders add $5.00. Make checks payable to AWA Museum. 155 pages, 107 illustrations, soft cover.

BY JAMES P. RYBAK

PRE-1930 COLOR TELEVISION

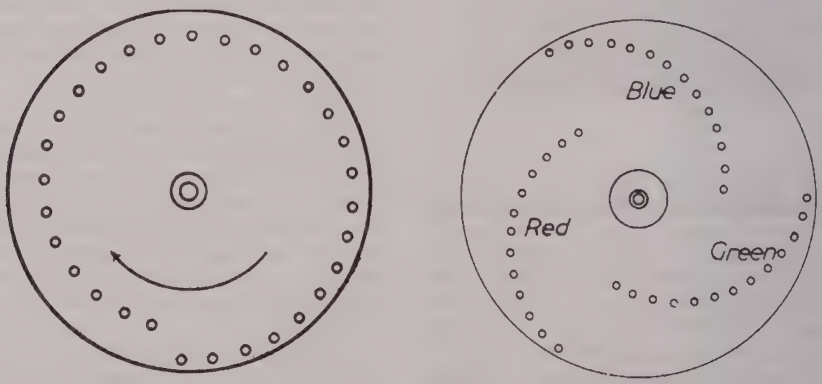
It was 1929 and almost 40 years before color television would become commonplace in the homes of American and British viewers. Nonetheless, by that year it already had been clearly demonstrated by researchers in both countries one day television viewers would be able to see the images in natural colors. It was also clear that many more advances in technology would be needed before either color or monochrome television would achieve commercially acceptable levels of quality.

During much of the 1920s, work on the development of all aspects of television was actively being undertaken in a number of countries, both by private individuals and by corporate and government funded laboratories. A relatively small number of creative and farsighted people were already convinced that sending both still and moving high-quality images over long distances was an achievable goal. The equipment being built at that time for implementing this goal, however, produced very crude results by today's standards. It consisted as much of whirling motors, gears, and metal disks as it did of electronic components.

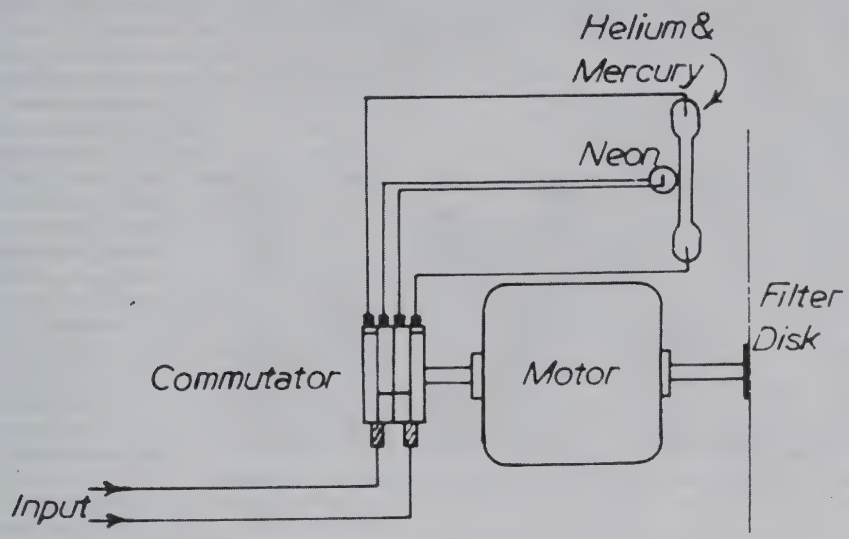
Most of those working on the development of television realized that public demonstrations of the technological achievements they were making were crucial for generating the interest and financial support required to continue their work. No one was more aware of this than John Logie Baird.

Born in Scotland on August 13, 1888, Baird did not do well in school due to his chronic poor health. Although he had studied electrical engineering and worked for a short period, beginning in late 1916, as an assistant engineer for an electrical utility company, Baird wanted more freedom to pursue the things that interested him. He spent the next several years of his life being self-employed, making and selling first socks, then jams, soap, and honey. Some of these enterprises were moderately successful but Baird's poor health repeatedly forced him to liquidate the businesses. Most importantly for his future work, however, John Logie Baird learned the value of advertising and publicity.

First and foremost, Baird loved tinkering and experimenting, not running a business. The possibility that images might be sent electrically over long distances had fascinated him since he was a boy. With the help of several assistants, Baird built in 1923 a crude device that, arguably, was the world's first electromechanical system capable of transmitting images of moving objects. However, the moving images Baird pro-



The Nipkow disk for monochrome television scanning (left) had a single spiral of holes; the version used by Baird for color television (right) had three separate spirals.



Baird reconstructed the color image at his television receiver using two separate discharge lamps controlled by a commutator (switching device) in the motor shaft.

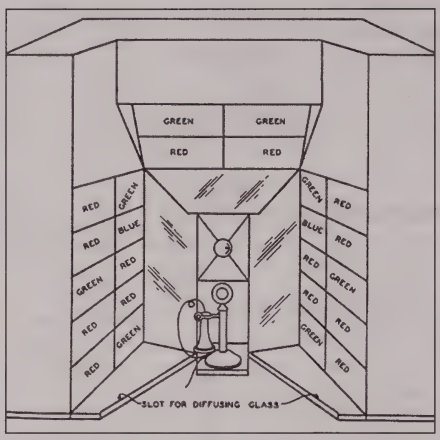
duced on his "televisor" were only shadowgraphs or silhouettes. The transmission of live, moving, cinema-type images with various shades of light and dark would come later. A British patent on this device was awarded in 1924 to Baird and his new partner who, after seeing a demonstration of the device, had provided modest financial support [1, 2, 3, 4].

John Logie Baird's image transmission system used a rotating Nipkow disk for mechanically scanning the image to be transmitted. Baird would remain committed to mechanical scanning through most of the 1930s, even after others had abandoned the Nipkow disk and were developing all-electronic systems of television. The public got a chance to view the crude silhouette images produced by Baird's televisor in a London department store window in March and April of 1925. While this was not a demonstration of true television, it nonetheless generated a moderate amount of interest together with a few small donations of cash and equipment that enabled him to continue to improve his invention. Substantial financial resources were needed, however. Stock was sold to adventurous investors enabling "Television Ltd.," the first of several companies Baird would form, to be organized in June of 1925 [1, 3, 4].

By January of 1926, Baird's work had progressed to the point that he was able to demonstrate moving images of human faces, with shades of light and dark, to approximately 40 members of the Royal Society and other notables. The Nipkow disk Baird used in this system produced images at a rate of 5 frames per second with a definition of 30 lines per frame [5].

Baird was now able to achieve appropriate shading of light and dark in the images because he had developed a photocell and associated circuitry which responded to changes in brightness much more quickly. This new photocell was significantly more sensitive than the one he had been using previously. The improvement resulted from the fact that Baird was now able to better match the peak sensitivity of the photocell to the light source he was using [3, 4, 6].

The January 1926 demonstration generally is cited as the first public demonstration of true "television," since Baird's equipment now was capable of producing actual grayscale images, not merely silhouettes. Later that year, he was sending experimental television signals across London by wireless and also was demonstrating a "Noctovision" television system that used in-



AT&T's "cage" for the transmission of color television. Locations of filters and photocells for detecting the red, green, and blue image components are given.

frared, rather than visible, light to illuminate the subjects being televised [3, 6, 7].

Due to the low frame rate and low scanning resolution Baird was using, the video signal produced was comprised of frequencies in the audio range. As a result, he was able to make wax phonograph recordings of video signals, just as one would record voice or instrumental music in those days. This first form of video recording occurred some fifty years before the advent of videotape and videodisks [2, 3, 4].

Researchers in other countries, notably the United States and Germany, also were working diligently to develop television. At this time, however, the achievements of his would-be competitors largely were eclipsed in the minds of the public by Baird's numerous and well publicized demonstrations of his accomplishments.

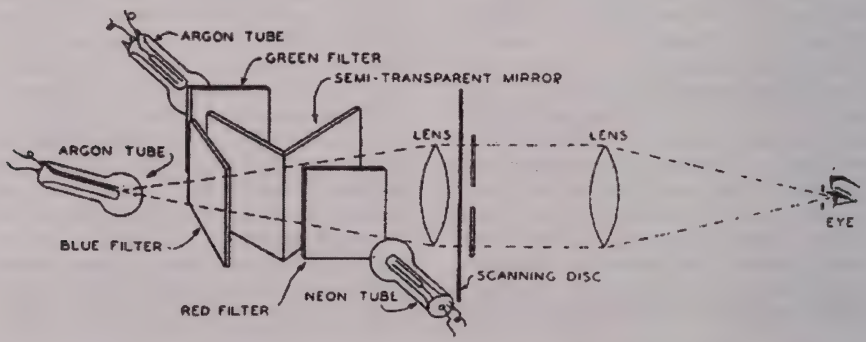
Bell Laboratories, which soon would become Baird's most prominent competitor, did not publicly demonstrate television until April of 1927 [5, 7, 10]. Baird and his associates maintained that, even then, the Bell Labs apparatus was basically just a copy of Baird's own equipment [4].

In April of 1927, the Baird Television Development Company was formed. Late in May, the company transmitted recognizable television images of Baird, himself, by wire from London to Glasgow, a distance of 438 miles. This was double the distance between Washington and New York over which the Bell Laboratories had transmitted by wire live pictures of Secretary of Commerce (later President) Herbert Hoover, and others, just one month earlier [1, 2, 3, 5, 7]. Something of a professional rivalry in the advancement of television was developing across the Atlantic between the Baird organization and the Bell Laboratories.

Baird and his associates believed that they could better their own record for long distance televising by a substantial margin. In September of 1927, a Baird Company technician was sent to the United States with components for building a television receiver. His job was to build the receiver in New York so that a trans-Atlantic transmission of television images by wireless could be demonstrated.

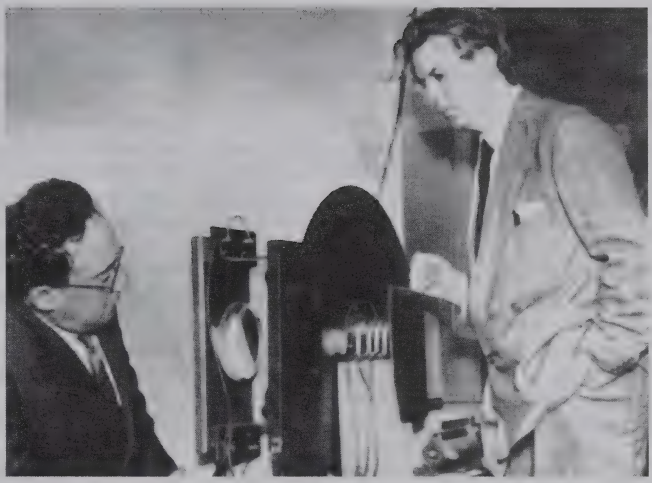
Months of testing were required due to the unpredictability of wireless propagation as well as to the temperamental nature of the television equipment. Finally, Baird made a successful trans-Atlantic demonstration of his television system on February 8, 1928. Four people attended the demonstration in New York, including a representative of Reuter's Press.

The images of a man and woman transmitted across the Atlantic Ocean and received by Baird's equipment looked as though they were



The AT&T color television receiver used three discharge lamps together with a set of semi-transparent mirrors to reconstruct the image.

being viewed through frosted glass. The strength of the received signal was weak and the synchronization of the scanned lines comprising the images was poor. Nonetheless, a *New York Times* article asserted that Baird's demonstration "deserves rank with Marconi's sending of the letter 'S' across the Atlantic" (in 1900). The author of the article acknowledged that, in both cases, the actual communication value of the transmission was insignificant. What was significant, the author maintained, was the milestone each event represented in the development of their respective modes of communication [3].



John Baird (standing) shows his 1928 color TV apparatus to Sydney Mosely. From the book "John Baird" by Sydney Mosley.

The *New York Herald Tribune*, in its comments on the trans-Atlantic transmission, noted that "It is said that probably one thousand engineers and laboratorymen were involved in the American (Bell Labs' Washington - New York) tests. Only a dozen worked with Baird" [6].

Because he now was using highly sensitive photocells, Baird then showed that it was possible to break television loose from the requirements of indoor studios with intense artificial lights. On June 11, 1927, he publicly demonstrated the televising of people in motion outdoors, using only natural daylight. It was immediately apparent that the televising of outdoor festivities and sporting events was a use for which this new medium of communication would be well suited [3, 8, 9].

The next public demonstration, conducted by Baird in 1928, attracted even more attention. On July 3, he showed a color television system he had developed based on the three-color separation process.

It long had been known that mixing the proper amounts of light in the primary colors (red, green, and blue) could produce light of any color. The crucial part in obtaining faithful color reproduction comes in determining the proper amounts of the primary colors of light to be combined.

In place of a conventional Nipkow disk, Baird used one with three separate spirals of scanning holes. The first spiral was covered by a red filter, which allowed only red light to pass. In a similar manner, the second spiral was covered with a blue filter while the third spiral was covered with a green filter. Three separate photocells, with one specially designed for each of the primary colors, were used to detect the light reflected by the subject being scanned. Behind the scanning disk was an intense light source.

The recent development of highly sensitive photocells allowed Baird to use this "flying- spot" form of scanning. The flying spot scanner eliminated the need for a focusing lens to be placed in each hole of the Nipkow disk. In addition, it eliminated the need for almost unbearably intense light to continuously illuminate the entire subject being scanned. Now, only a very slender, intense beam (or "spot") of light swept back and forth across the subject during the scanning process.

As the Nipkow disk in Baird's color television transmitter revolved, the subject being televised was scanned first by a red spot of light, then by a blue spot and, finally, by a green spot. The photoelectric cells of the transmitter responded to the light reflected from the subject and produced first a signal representing only the red portion of the picture. This was followed by a signal representing only the blue portion, and finally by a signal representing only the green portion of the picture. Because the three signals were generated and transmitted sequentially, only one communication channel was required.

A similar Nipkow disk with three separate spirals of holes covered by red, blue, and green filters was employed at the receiving station and was synchronized with the disk at the transmitting station. Behind this disk, in place of the single neon tube used for monochrome television,

were two separate glow discharge lamps. One was the usual neon tube, which produced red light. The second lamp contained a mixture of neon and mercury vapor that enabled it to produce a mixture of blue and green light.

Though use of a commutator, only the neon lamp was activated when the red viewing holes in the receiver disk were between the eyes of the viewer and the lamps. Similarly, when either the blue or green viewing holes rotated into position, only the helium-mercury lamp was activated. The brightness of these lamps varied in proportion to the intensity of the signal generated at the transmitter by the red, blue, or green portion, respectively, of the picture being scanned [8, 9]. The persistence of vision of the viewer's eye provided the superposition of the three colors.

Baird's 1928 demonstration of television in natural colors was made to a group of journalists and scientists. The observers reportedly were very much impressed with the natural quality of the colors observed. Among the objects televised during the demonstration were a policeman's blue helmet, a human face, and a basket of strawberries [8, 9].

The 1927 Washington to New York television transmission mentioned previously had been Bell Laboratories first public demonstration of true television. The Labs, however, had been working on the development of television for several years prior to that time.

In 1925, Bell Labs had placed in commercial operation a facsimile system for transmitting photographic images over telephone lines. The system had first been used in March of that year to transmit photographs of the Coolidge inauguration from Washington to New York, Chicago, and San Francisco. The facsimile system required seven minutes to transmit one photograph. A true television system would have to send each image in no more than one-fifteenth of a second [10].

Immediately following the establishment of the facsimile system, Bell Laboratories outlined a research plan for developing television [7, 10]. It did not plan to demonstrate television until the image quality achieved was comparable to that which the public had grown to expect from the telephone service it provided [10]. That goal, however, may have been compromised somewhat by the desire to offset the favorable publicity Baird's demonstrations were producing for his company.

The Bell Laboratories knew that the development of color television should be the ultimate goal of television researchers. It also was very much aware of Baird's demonstration of his color television system. By the spring of 1929, Bell Labs had a color television system of its own ready to demonstrate.

The Bell Laboratories' color television system operated somewhat differently from Baird's system. The Bell flying spot system scanned the subject to be televised with a thin, intense beam of white light. The light source and scanning disk were not modified in any way from those used for monochrome television [11].

The light reflected from that subject was detected by three sets of newly developed photoelectric cells. Each set of cells was provided with a red, green, or blue filter, respectively. The new photocells were very sensitive and responded more uniformly to light of all colors than had the cells previously used by Bell Laboratories for monochrome transmission [12].

The cells were positioned in a "cage" configuration of 24 that surrounded the object being televised on three sides. In this arrangement, two cells had blue filters, eight had green filters, and fourteen had red filters. The number of cells used with filters of each color was determined by the relative sensitivity of the cells to light of the three colors.

The outputs of all the cells with filters of a given color were connected together to produce three simultaneous video signals, one for each of the colors. Consequently, three separate communication channels were required for this color television system in place of the one channel used for monochrome television. Each of the three color channels was virtually identical to the one channel Bell Laboratories used for its monochrome transmissions [11, 12, 13].

The three video signals had to be received simultaneously with each signal used to control the intensity of an appropriately colored light source. The outputs of the light sources were then superimposed and viewed simultaneously.

One neon lamp together with two argon lamps located behind the Nipkow disk were used as light sources at the receiver in the Bell Laboratories system. The neon lamp and its associated red filter provided the red light needed. The light from one of the argon lamps passed through a blue filter while that from the other argon lamp passed through a green filter. As a result, the needed blue light and green light were produced. The intensity of each of the three light sources was varied by the corresponding video signal.

The light from the three sources then passed through semi-transparent mirrors and focused into a small aperture in front of the Nipkow disk. The observer looked into this aperture through a magnifying lens and received the light from the

(continued on page 36)

BY BILL FIZETTE, W2DGB

A STRUCTURED APPROACH TO FIXING UP THOSE NICE OLD RADIOS

5—Condensers and Resistors

For those of you who have been following this series on fixing up "old" radios, I recall promising you that we would finally get into a radio about now. However, before we go too far too fast, let's digress for a moment and touch on one of the most important parts of the repair process, the subject of the so-called "passive" components.

In comparison to active components like tubes (or transistors, if you will, although this series is about the earlier tube sets), capacitors, resistors and inductors are termed passive in that they don't require an operating voltage. There is a tendency for a beginner to concentrate on the tubes as a source of problems. Actually, it is often the reverse.

Resistors do as the name suggests; a resistor resists a flow of current and in the process there is a voltage drop across it, proportional to the current flow in accord with a mathematical relationship called "Ohm's Law." If you aren't familiar with Ohm's Law, look it up. It is a very valuable tool.

Capacitors (formerly called condensers) act in various ways. They may be frequency determining components, filters in power supplies, or bypasses in RF circuits. They may block direct current while passing AC signals, as in audio coupling circuits. In repairing an old radio with the object of making it "play" once more, we will first verify that the tubes are in the correct sockets and that their filaments are intact, that is, they light up. After that, we will turn our attention to the capacitors and resistors,

Resistors are relatively easy to check. Using your VTVM in the ohms function, simply check each resistor in the circuit by placing the probes across it. If the measured value is within 20%, according to the color code or the circuit diagram, or is lower, then the part is probably all right. NOTE: A resistor may be part of a circuit complex, giving a lower than indicated value. This does not mean it is still good, but the approach is to move on and leave further checking till later if necessary. However, if it is significantly higher, it should be replaced. Incidentally, an easy way to do this is to cut it out leaving the leads intact, and then fasten the replacement to the leads.

There are conflicting schools of thought on whether or not capacitors should be replaced. One school says that the capacitor has been in there for a long time, and the radio worked for a long time, so it is probably still good. The other one says that capacitors will degrade to the point where they don't perform, and can actually lead to further problems. Most of us tend towards the latter, even if the radio works at first, as it is just a matter of time until the capacitor starts to pass current and perhaps even shorts out completely. With cathode bypasses operating at low voltage it is not too serious, but with high voltage circuits it can lead to very serious damage of other components.

Why do the Cs and Rs go bad? It has to do with the materials used and the technology available when they were manufactured, and the environment in which the radio was stored over the years. Given enough time, moisture will work its way into a tubular capacitor and will combine with acidic compounds in the paper. Leakage will increase until the capacitor fails. It is not a matter of if, but when.

In contrast, mica capacitors will often remain good even after 50 years, and most restorers tend to ignore these, at least at first. Disk ceramics and the newer Mylar capacitors are relatively stable over time, and are commonly used by restorers if they can be kept out of sight. Electrolytics used in power supplies often dry out, begin to leak heavily, and must be replaced. Resistors also will undergo electro-chemical changes, especially if moisture is present. They usually increase in

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value, although it cannot be predicted which ones, and how much. Thus, the need for checking.

As an example of the need to check replacement Cs and Rs, I recently acquired some new old stock electrolytic can capacitors in the original boxes. While beautiful to look at, none passed the test...they simply could not be reformed. (NOTE: An electrolytic capacitor can sometimes be "reformed" by placing a low DC voltage of the correct polarity across it and slowly raising the voltage until it reaches the capacitor's rated value. This rebuilds the electrolytic film that provides insulation within the capacitor.) However, I kept them for appearance restoration, with the actual filtering relegated to new small units mounted out of sight under the chassis.

I was also given a handful of new old stock mica capacitors, which I expected to be still useable, based on experience. These are usually good for at least 400 volts, but in this case only one of 18 was good above 15 volts on my capacitor checker. I threw them all out.

One important precaution should be noted here. Applying power to a radio with a power transformer where the electrolytic filter capacitors are essentially dead and shorted out can easily result in a massive current draw, which in turn may burn up the transformer. New electrolytics are easy to come by and inexpensive, but the transformer may be irreplaceable.

So where are we now? If you have been following along, you have a bit of philosophy about what and what not to tackle, you have a dedicated place to work, with some basic test instruments, and you now have some initial background on two major classes of electronic components, capacitors and resistors. Next time I will describe my adventures with a little AC-DC communications receiver, and what I had to do to make it "play again."

PRE-1930 COLOR TELEVISION, *continued from page 34*

three lamps through each hole of the disk as it rotated past his eye. When the intensities of the each of the three video signals (and therefore the output of each light source) were properly adjusted, the viewer saw the image in its true colors [12].

These demonstrations had shown that color television was possible. However, it was clear to many by the early 1930s that mechanical scanning could never produce images of sufficient quality to make either monochrome or color television commercially successful.

Efforts to develop all-electronic television systems were undertaken by both individuals and corporations in a number of countries. "Almost" all-electronic color television was demonstrated in both the U.K. and the U.S. by 1940. While scanning now was being accomplished electronically, rotating mechanical disks with colored filters still were needed at both the transmitters and receivers. World War II delayed the development of all-electronic color scanning devices as well as cathode ray tubes that did not need rotating filter disks. Technical, political, and economic factors caused further delays in making color television a common form of home entertainment until the 1960s.

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THE COMMUNICATIONS RECEIVER

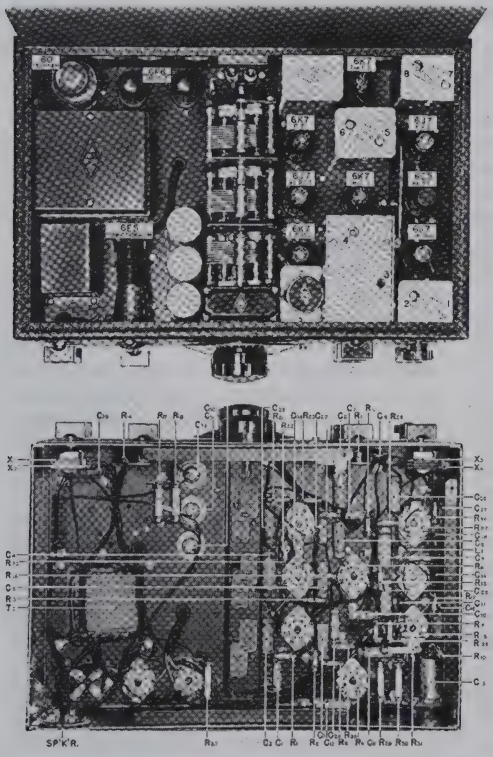
EDITED BY **WILLIAM FIZETTE, W2DGB**, RR 1, BOX 55, HENRYVILLE, PA 18332
PLEASE INCLUDE SASE FOR REPLY.

Restoring A Classic National NC-100 Receiver

Part 2—Completing the Restoration

In the last issue we started the discussion of the restoration of a 1936 five-band National NC-100 receiver. While the model illustrated, the original art-deco version, is somewhat rare, there are many of the later versions still waiting for attention. This includes the NC-101, the amateur version, as well as the somewhat larger "A" Models with the direct reading dial. The circuits and the physical layout are essentially the same, so this approach will apply to all.

The goal of this exercise, which was not made clear in the last installment, was to restore this particular receiver—both physically and electrically—to working condition. If you take on the project, and don't wish to go to the effort to make your set operate, restrict yourself to cleaning the outside and the chassis, and repairing any sloppy past service work.



Top and under-chassis view (tray removed) of the original "eye tube" NC-100. This is the crystal-filter version. The photos were scanned from an old catalogue and we weren't able to remove the moiré pattern caused by interaction with the original engraving dots.

Much of this material has been presented previously in one context or another, but the newer readers may appreciate the overview. You will note that I have made frequent reference to prior articles in *The OTB*, some several years old, and these may not be readily available. If you can't locate a particular article, the AWA now has back *OTBs* available on CD ROM. Refer to the ad elsewhere in this issue.

It was now time to recap the receiver and check all the resistors and other components, as well as all solder joints, both old and new. This work is somewhat tedious, but absolutely necessary. (It only takes one bad component or one cold solder joint to turn an otherwise good job into a nightmare, so take your time and do it right the first time.)

Moving parts such as switches and pots were lubricated and cleaned until an ohmmeter check showed proper action. In many cases the resistors were still good after some 60-plus years, and these were left in place. Those outside of spec were replaced. If gain control pots, especially, didn't show a smooth action they also were replaced.

Fixed capacitors of this age (with the exception of micas), and even those much newer, are usually bad, and it does not pay to fool around with them. Alan Douglas, in his new book on test equipment, explains some of the background for this ra-

(continued on page 40)

RECENT RADIO, TV AND ENTERTAINER OBITUARIES

COMPILED BY **CHARLES S. GRIFFEN W1GYR**
1225 NEW BRITAIN AVE., WEST HARTFORD, CT 06110-2405

Note: When known, the date of death is indicated in parenthesis.

STEVE ALLEN, 78, (10-30-00) versatile entertainer, actor, composer and writer. Allen pioneered the late-night television format with the original *Tonight* show which began locally in New York City on NBC's WNBT (TV) in June 1953. He remained the host of the program when it moved to the network 15 months later. Some of Allen's other TV credits include *The Steve Allen Show* (CBS 1950-1952 and NBC 1956-1961), *What's My Line* (CBS 1953-1954), *The Steve Allen Comedy Hour* (CBS 1967 and NBC 1980-1981) and *Meeting of the Minds* (PBS 1977-1981). He began his broadcast career in 1942 as an announcer on KOY(AM) in Phoenix. Three years later Allen joined the Don Lee Network on the West Coast and did a weekly program called *Smile Time*. In 1948 he was hired by KNX(AM) to be a midnight deejay where he developed the format (talking, interviewing celebrities and audience members and piano playing) that would be the basis of what he would do on TV. Allen wrote thousands of songs, including *This Could Be the Start of Something Big*, authored fifty books and appeared in films including the title role in *The Benny Goodman Story*.

GARY D. CLARK, 61, (8-12-00) radio newsman. Clark was associated with KNX(AM) in Los Angeles from the late 1970s until 1988 and helped establish the Associated Press Radio Network. He began his radio news career at KSPI in Stillwater and KBIX in Muskogee, both in Oklahoma, before moving to Santa Barbara, CA where he worked at KDB and KTMS from 1968 to 1978. He was the former President of the California Associated Press Television and Radio Association.

LOUIS M. CORREIA, 74, (11-18-00) broadcast engineer. Correia was Chief Engineer at WGY and WGFM in Schenectady, NY for 17 years. Earlier he was a broadcast and production engineer for WROW in Albany and WBSM in New Bedford, MA. Correia was Vice President of Engineering for SKY Communications for three years prior to retiring in 1990.

FRANKIE CROCKER, no age, (10-21-00) radio personality and program director. Crocker's association with WBLS(FM), a black-music format radio station in New York City, helped make it the top rated station among listeners 18 to 34 years of age twice in the last three decades. He joined the station in 1970s, but left it twice only to be rehired in 1995 when its ratings declined. Crocker coined the phrase "urban contemporary" in the 1970s, a name for the variety of songs he selected for his programs. In addition to working for others stations in Chicago, Los Angeles and St. Louis, Crocker was Master Of Ceremonies at the Apollo Theater in Harlem and appeared in a number of films.

RICHARD FARNSWORTH, 80, (10-6-00) character actor and stunt man. Last year Farnsworth received best actor Oscar and Golden Globes nominations for his role in *The Straight Story*. Some of his other film credits include *Comes a Horseman* (1978), *Tom Horn* (1980), *The Grey Fox* (1982), *Misery* (1990) and *The Getaway* (1954). Farnsworth started his career as a stunt man in 1938 and during the next 30 years doubled for Roy Rogers and other Western stars. By the time he retired from stunt work in 1977 he had been a stunt man and stunt coordinator on more than 300 films and television programs.

EDWARD KANE, 76, (no date) newscaster. Kane spent the final 24 years of his career with the Associated Press Radio Network in Washington, DC. There he anchored AP's hourly newscasts from 1974 to 1980. After retirement he co-produced and announced the *Home Front* feature for AP Radio until 1998. Prior to joining the AP he anchored newscasts on ABC Radio starting in 1967. Kane began his broadcasting career at WRJM in Newport, RI and later moved into television joining the staff of WBZ in Boston where he narrated the evening news from 1953 through 1960.

JULIE LONDON, 74, (10-18-00) singer and actress. London recorded more than 30 albums,

including *Julie is Her Name*, *Lonely Girl, Calendar Girl, About the Blues* and *London by Night*. She made her film debut at 18 opposite Buster Crabbe in the 1944 film *Nabonga*. Some of her other film credits include *The Red House*, *Fat Man, Man of the West* and *The Great Man*. London made guest appearances on variety television programs hosted by Bob Hope, Dinah Shore and Perry Como and was a regular on NBC's *Emergency* (1972-1977).

LEWIS G. "MAC" McCOY, 84, W1CP (ex-W9FHZ, W0ICP) (7-31-00) technical writer. McCoy joined the American Radio Relay League's staff in 1949, first at W1AW and later in the Technical Department where he was a frequent contributor to the ARRL magazine, *QST*. He continued to write for *QST* after he left the League in 1978 and was also a Technical Editor of *CQ* magazine. McCoy had been a member of the Quarter Century Wireless Association's Board of Directors and served as their President from 1994-1996. In July he was reelected to the Board.

ZEKE MANNERS, 89, (10-14-00) hillbilly singer, disc jockey and composer. Manners hillbilly persona, which was developed during a 1930 publicity stunt on the West Coast, became a success when he moved to New York City .By the 1940s he was hosting country music programs daily on WMCA, WINS, WHN and intermittently on others. From 1950 to 1952 he was the host of one of television's earliest talk shows, which aired for two hours on Channel 7, WJZ (now WABC) in New York City. Manners' disc jockey program, which originated in Los Angeles, was heard nationally on the ABC network (four shows were broadcast for each time zone). He wrote hundreds of songs including *The Pennsylvania Polka*, written with Lester Lee and introduced by the Andrew Sisters in 1942.

RICHARD MULLIGAN, 67, (9-26-00) actor. Mulligan is best known for starring in the long-running sitcoms *Soap* and *Empty Nest*. He won Emmys for his performances in them in 1980 and 1989 respectively. On stage he appeared in *Harvey* with James Stewart and co-starred with Julie Andrews and William Holden in *S.O.B.* Some of his film credits include *Little Big Man* (1970), *Trail of the Pink Panther* (1982) and *Micki and Maude* (1984).

ROBERT I. "SHAD" NORTHSHIELD, 78, (8-21-00) news producer. Northshield made a lasting contribution to TV when he created CBS News' *Sunday Morning*. The 90-minute program, combining news, culture and nature, has been a weekend fixture for more than twenty years. He joined CBS Television in New York City in 1953 as an Associate Producer of Public Affairs and News Programs. Northshield was hired by NBC News in 1958 where he spent 17 years producing the *Today Show* and *The Huntley-Brinkley Report*. He rejoined CBS in 1977 in the Sports Division, but soon moved to the News Division as Executive Producer of the CBS Morning News. Northshield retired from CBS News in 1995.

JEAN PETERS, 73, (10-13-00) actress. Peters was one of Hollywood most popular leading ladies during the 1940s and early 1950s. A sampling of her film credits includes *It Happens Every Spring* (1949) with Ray Milland, *Viva Zapata* (1962) with Marlon Brando, *Three Coins in a Fountain* (1954) with Dorothy McGuire, *Apache* (1954) with Burt Lancaster and *Broken Lance* (1954) with Spencer Tracy. Peters gave up acting in 1955 in order to marry billionaire Howard Hughes, but after their divorce in 1971 she resumed her acting career on television. Peters last appearance was in the 1981 CBS movie *Peter and Paul*.

MARY SINCLAIR, 78, (11-5-00) television actress. Sinclair appeared on such live drama programs as *Dumont Royal Theater* (1951-1952), *Starlight Theatre* (1950-1951), *Studio One* (1948 -1958), *The U.S. Steel Hour*, and *Playhouse 90*. She came to New York City in 1941 and worked as a model and in summer stock with a goal of becoming an actress. Sinclair gained valuable experience as a freelance television actress in the years that followed and in 1951 signed a seven-year contract with CBS Television. The New York Times described her as the first dramatic actress "to enter video's incubator for hatching its own stars."

ROBERT TROUT, 91, (11-14-00) broadcast journalist. Trout was noted for his crisp baritone voice, accurate reporting and ability to ad-lib for extended periods of time. During his nearly 70-year career, mostly with CBS News, he covered such varied events as D-Day, the Duke of Windsor's marriage and New Year's Eves from Times Square. Trout began his career in 1931 as a news announcer for WJSV in Alexandria, V A. He remained with the station when it was acquired by CBS in 1932, relocated to Washington, D.C., and renamed WTOP. In the mid 1930s Edward R. Murrow invited Trout to join CBS' fledgling news staff in New York City. During the next two decades he was heard on *Transatlantic Call*, *History Behind the Headlines, World News Roundup, Headlines and Bylines*, and *The News Till Now*. On television, Trout moderated *Presidential Timber* (1948-1952), emceed *Who Said That*? (1948-1951) and co-anchored the CBS

News coverage of the Democratic National Convention in 1964. Until two weeks prior to his death he delivered essays for National Public Radio's *All Things Considered*.

GWEN VERDON, 75, (10-18-00) actress. Verdon is probably best remembered for her stage roles in the musicals *Damn Yankees* (1956), *New Girl in Town* (1958) and *Redhead* (1959). Her superb dancing and comic artistry in *Can Can* (1954) advanced her career from little known dancer to stardom. The four shows mentioned above each earned her Tony Awards. Verdon later appeared in dramatic roles in films and TV shows including *Magnum P.I., Alice, The Cotton Club, Best Friends for Life* and *Marvin's Room*.

Information for this column was obtained from *Broadcasting and Cable, The Complete Directory to Prime Time Network TV Shows 1946 -Present (4th ed.), The Hartford Courant, The Murrow Boys, On the Air: The Encyclopedia of Old- Time Radio, QST, The New York Times* and *Variety*.

Thanks to Dr. John M. Anderson, Frank Q. Newton, Jr., W6SYG; Rodney K. Schrock, KD3OR; Fred Swanson, Edwin C. Tyrrell, Jr. and Dr. A. David Wunsch for additional source material.

COMMUNICATIONS RECEIVER, *continued from page 37*

tionale. If I want a communications-type radio to work properly, and it is not a rare collectible, I simply replace all capacitors with modern units, and this approach was followed here.

I have used mylars, metal-glass, micas, and disk ceramics successfully in most applications, with one exception; I usually prefer tubulars for audio circuits. With electrolytics there is no question; I routinely replace them. In the case of the rather unique audio cathode electrolytic in the rear corner, I prefer to leave it in place for appearance, cut the wire, and install a small modern replacement with its resistor directly at the tube socket.

Bad wiring was either replaced or protected with black spaghetti. A new line cord was installed, and a fuse wired in under the chassis next to the power transformer. The cleaned and checked coil tray was reinstalled, with lubrication of thin grease on the carrier rod and pinion gear assembly. Missing hardware was replaced. All tubes were checked on a good mutual conductance tube checker, and substandard ones were replaced.

The eye tube can be a special case. Many appear dead even though the filament is good. Procedures for bringing them back to life have been described, but I have not tried this. Fortunately, the later, more common, versions of the NC-100 series receivers used a meter instead.

It was now time to work over the cabinet parts. The art deco aluminum panel, riveted to the front shroud, was gently cleaned with paste furniture wax and very fine steel wool. The black crackle finish was washed to remove surface dirt, and in this case, wiped down with Scott's Liquid Gold furniture polish, bringing up the highlights. However, this is certainly not the best approach if the finish has been abused.

One way is to gently mist the surfaces with a good quality black spray enamel. Another, and probably better way, is to use a piece of Turkish toweling and rub the black enamel over the finish, thus avoiding filling in the fine spaces. All knobs were buffed down with a cloth wheel and fine jewelers rouge. The "PW" dial was taken apart, cleaned and lubricated, and reassembled (*OTB*, Nov. 1995).

The parts were then reassembled into a radio, complete with one exception. This circuit, like so many of those from the 1930s and early 40s, used a speaker with a field coil, which doubled as a power supply filter choke. If you have the original, and the field measures about 400 to 500 ohms, you are all set. If a replacement must be made, follow the procedure outlined in *The OTB* in the May 1998 issue.

I have not had much luck reusing dynamic speakers from old BC sets; for some reason they usually sound distorted, even if I could find one with the proper field resistance. A good modern PM speaker with the added filter components mounted in the speaker cabinet will probably sound much better. Be sure the output transformer, also mounted in the speaker cabinet, matches the PP 6F6 audio tubes and can handle the power.

Alignment was simple, as the coils were originally wound to exacting specs on very stable forms. Only the oscillator trimmers and the IF circuits needed attention, using standard procedure. These receivers are a delight to use, especially with the 12-foot effective bandspread of the PW dial, and this one was no exception.

If you have questions about this restoration, I can be reached via email at w2dgb@enter.net, or if you must use the postal service, a SASE will assure you of a reply.

RADIO REPRODUCERS

EDITED BY **DAVE CROCKER**, 35 SANTUIT POND RD., #4B, MASHPEE, MA 02649
PLEASE INCLUDE SASE FOR REPLY.

Since anything pertaining to the hot radio market of 1923 seemed successful, it must have been an easy decision for the Wilson Utensil Company of Dayton, Ohio to turn its machinery from spinning aluminum for pots and pans into something for the expanding radio market. That "something" turned out to the horn speaker we know as the "Moon Radio Phone," which sold for $7.50 in 1923. The company had no connection to the Moon Radio Corp. of Long Island City, NY.

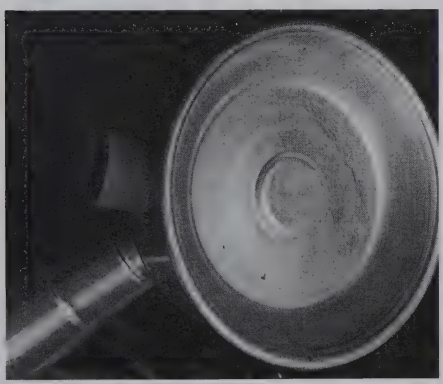
The all-aluminum Moon Radio Phone speaker. Background silhouette added by author.

A close look at the Moon nameplate attached to the base of the horn.

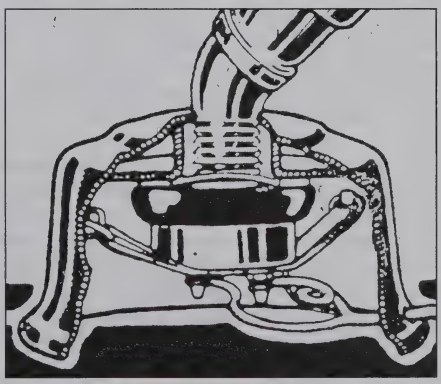
Wilson's first model featured a spun aluminum, 6" diameter, base with a sealed bottom. The user slipped his headset receivers over the rubber-covered openings on opposite sides of the base. The music, voice, or whatever, from the receivers was directed into a sound chamber inside the base, then up and out the top into the horn neck.

The horn was also made of spun aluminum and measures 12" long with a 10" diameter bell. It was pivoted so it could rotate around from its neck in any direction. The overall height of the speaker is 15". Although the Moon advertisements mentioned a durable black finish, I know only of models with an aluminum finish, If anyone has one in black, let me know. The Moon speaker weighed in at only 6 pounds.

For the 1924 radio season, the Wilson Utensil Co. offered a single-headphone version, which had an open base. Up inside this cavity was a rubber strap, which the operator used to secure a phone receiver up against the horn opening. The price for 1924 remained at $7.50.



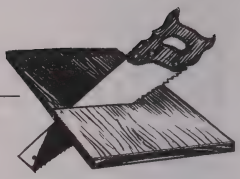
Underside of the base of the double-headphone 1923 model.



Cutaway of the 1924-model base, showing how the single headphone was inserted.

BREADBOARDING

EDITED BY **RICHARD A. PARKS**, 2620 LAKE RIDGE CT., OAKTON, VA 22124
PLEASE INCLUDE SASE FOR REPLY.



Bring Historical Circuits to Life On Your Workbench!

A Super-Simple RF Generator for Your Bench

I've been carelessly assuming that all you newcomers reading this column have the same well-equipped test bench that I have put together over the years. Readers of *The OTB* know that there is a kind of minimum list of test gear necessary for radio work— whether you're building from scratch, doing radio repair, or just experimenting. It's great to have a good multimeter; a test amplifier and speaker is nice to have; and a simple oscilloscope will help immeasurably in all kinds of testing and debug. But one of the first items on your bench ought to be a broadcast-band RF generator.

You can find equipment like that on the internet auctions and in radio classified ads. But what if you don't have manuals or schematics to help keep your gear in shape? Or how about the collector I know who runs a busy mail order radio business, and works on a kitchen table with nothing but a multimeter! For him, and for those of you who want to put together a really simple RF source, this project should be a winner!

Look at the schematic of Figure 1. There are back-to-back power transformers and a half-wave rectifier sending power to the single tube. The use of two transformers in this manner isolates the 115-volt output of the reversed primary of the second transformer from the AC line, a very necessary safety precaution.

One half of the 12AU7 is a Hartley RF oscillator just like the one in most every table radio; the other half is an audio oscillator that modulates the RF source. The output waveform is a sorta-sine wave, with enough useful harmonics to be heard into the SW bands, too. You can add controls to this unit: variable tuning, a fixed 455 kHz IF option, controlled output levels, and so forth.

The critical parts can be had from Antique Electronic Supply and Radio Shack. AES sells oscillator coil T1 (part no. PC-70), and the mod-

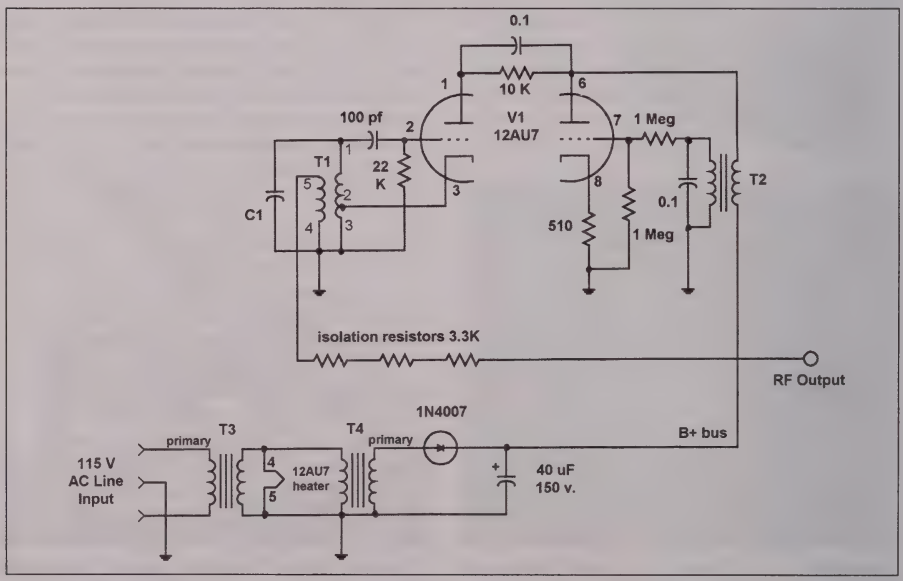


Fig. 1. Schematic diagram of the basic modulated RF generator.

ulation transformer T2 is from Radio Shack (part no. 273-1374). Power transformers T3 and T4 can be Radio Shack 273-1385 or larger. The other parts can come from the junk box.

Probably the first thing to do if you make one of these is to choose the cabinet and control panel combination. To prevent unwanted radiation from the unit, you should use a metal enclosure, preferably a steel one. The first one of these I ever built, when I was fourteen years old, was inside a gutted 'thirties Ford car radio cabinet! Better to have a cabinet a little bigger than it needs to be; it's inviting trouble to squeeze parts too close together. After you've read this column, decide how many control knobs and connectors will come through the panel.

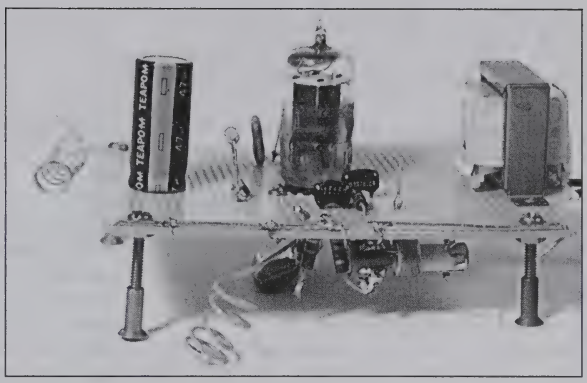


Fig. 2. Here's how the basic circuit looks as "thrown together" on a piece of perfboard. Only one of the two power transformers is shown.

Next, lay out the circuit itself. It took me half a day to throw my breadboard (Figure 2) together. I wired the circuit using a piece of perfboard about 4 by 5 inches. For a complete generator, most of the control options get connected to the circuit board from a front control panel. For instance: looking at the schematic, you'll see the RF tank capacitor (C1) is shown as a fixed cap. But if you want to make the output frequency variable across the BC band, go ahead and mount a junk tuning capacitor on the panel, and connect it to the oscillator coil in place of C1.

Maybe you'd also like to have a fixed 455 kHz setting—just mount an adjustable "padder condenser" somewhere on the circuit board across C1 and use a switch on the panel to change between that and your variable capacitor (See Figure 3). How about being able to switch the audio modulation on and off? Want control of the output voltage? Add a multipoint rotary switch and a resistor network, or maybe just a simple potentiometer control. The other circuits shown in Figure 3 will help you wire these options. Your output connectors can be banana jacks, BNC connectors, or simple RCA jacks, your choice.

Want a variable modulation index? Put a 5K pot across the plate winding of T2 and connect the wiper to the 10 K resistor that feeds the oscillator plate. Want to add a power switch and a pilot light? Go ahead. Connect a quarter-amp fuse in the power line while you're at it. Don't have enough B+ voltage? Hook up the secondary of T4 so as to add the 12 volts of heater power to the rectifier feed—that should raise B+ by about 16 volts.

Your unit can be an ugly breadboard like mine, or it can be built into a slick cabinet from a commercial vendor. Here are some voltage readings I took from my breadboard; they will help you if you have a problem:

RF Generator DC Voltage Readings
(B+ bus = 150 volts)

Tube pin 1	+95	pin 6	+150
pin 2	approx.-10	pin 7	0
pin 3	0	pin 8	+3.7

You should have about 4 volts of peak-to-peak RF signal at pin 5 of the oscillator coil. Don't forget, you can adjust the little ferrite core inside T1 to get the exact tuning range you're looking for. The three 3.3K resistors isolate the load from the tube. This reduces frequency drift when the load changes. Why three resistors? That's because any resistor has a small stray capacitance from lead to lead. We want "pure" resistance coupling to the output so that Ohm's law can be used to predict output level. Using three (or more) coupling resistors drops unwanted coupling capacitance to a real low value.

Since the output voltage is more than is needed for most radio work, you'll want to be able to lower it with the attenuator circuitry (down to just about zero for sensitivity measurements). Your single most useful item, though, would be a nice big readout for output frequency. You can listen to the output over a radio with a digital tuning system; go looking for harmonics, too.

To use this gadget, you couple its output signal loosely into the circuit or radio you're work-

(continued on page 45)

NEW BOOKS AND LITERATURE

EDITED BY **WILLIAM E. DENK, W3IGU**, 81 STEEPLECHASE RD., DEVON, PA 19333-1226
PLEASE INCLUDE SASE FOR REPLY.

Books to be reviewed in this column should be sent directly to Bill Denk at the address above. After review, all such books become a permanent part of The AWA Library, which is part of The AWA Electronic Communication Museum and is available to members for browsing and research.

Lindsay's Technical Books
Published by Lindsay Publications, Inc., P.O. Box 538, Bradley, IL. 60915-0538 Tel. 815-935-5353. 8½ x 11 inches, 103 pages, free.

This is a catalog of (to use its own sub-title) "Unusual technical books, past and present, of exceptionally high quality revealing skills and secret processes almost forgotten." Although the publisher supplied me with copies of five books for review, this catalog deserves a review on its own merits.

Each book listed in the catalog is provided with its own brief review. Included in the offerings are "How We Invented The Airplane" by Orville Wright" at $9.95, and "Wireless Experimenters' Manual" at $13.95. The catalog's index lists about 200 different subjects from "Advanced Machine Work" to "Woodworking Tools," including coil winding machines, embalming(!), induction heating, radio, telescopes, and more. It is entertaining just to leaf through the catalog to learn what is available in print.

One of the books supplied was a 56-page reprint of the *Thordarson Transformer Manual* at $11.95. It includes sections on transformer coupling, push-pull circuits, pre-amplifier circuits, and more. Another was a reprint of a 437-page book, *Handicrafts for Handy Boys* by Neely Hall, subtitled "Practical Plans for Work and Play with Many Ideas for Earning Money." Also included in this book, originally published in 1911, are chapters on tools and shop equipment for the home workshop, manual training, wood finishing, easily made furniture, a boy's wireless telegraph outfit, model airplanes, and much more.

An illustrated handbook entitled *Crystal Receiving Sets and How to Make Them* is undated but must be a reprint of a 1920s book. A preface states that it was compiled from the pages of *Amateur Wireless*, a weekly journal of the period. The handbook sells for $10.95.

The Impoverished Radio Experimenter is subtitled "Tricks, tips and secrets to help the builder of simple radios and electrical gear achieve high performance at minimal cost." This booklet contains old-time projects using currently-available parts and includes an 8-page table of receiving tube characteristics.

Finally, Lindsay provided a reprint of the 1940 *Amateur Radio—A Beginner's Guide* by Douglas Fortune, W9UVC, priced at $9.95. This little book (155 pages) has sections on "Learning The Code," "Receiver Theory and Construction," "Crystal Oscillator Transmitter," "Two Stage Transmitter," "Construction of a Modulator for Three-stage Transmitter," and more.

Even if you decide not to acquire one of these books, by all means obtain a copy of the Lindsay catalog!

♦ ♦ ♦ ♦

From The Wireless to the Web—The Evolution of Telecommunications 1901-2001
By Peter R. Jensen. Published 2000 by University of New South Wales Press Ltd, Sydney 2052, Australia. 7¾ x 10 inches, 306 pages, hardcover. $49.95. Order from International Specialized Book Services, 5804 N.E. Hassalo Street, Portland, OR 97213-3644.

As the title suggests, this new book covers the development of radio from its beginnings to the present. But it is by no means the rehashing of a story with which AWA readers are already familiar. This reviewer's initial reaction, "here we go again," was quickly dispelled and, once I started reading, I couldn't put the book down until I had read all 306 pages.

The author, an Australian, acknowledges assistance from many people in Australia, Great Britain, the United States, and Canada; this is evident from the book's scope and perspective. Fifty bucks is a lot of money for a book, but this one is well worth it.

The first seventy-three pages are devoted to a review of early developments in The United Kingdom, Germany, Canada, Australia, The United States, and Antarctica centered on spark technology. Included is a section on spark transmission methods. This is followed by a chapter

on "Wireless in the First World War," which includes material on the contributions of Major Edwin Armstrong.

The television activities of Farnsworth and Zworykin are dealt with in one short chapter. A chapter on "Radio at War" deals with radio developments during World War II, including radar. An interesting chapter on "Codes, Ciphers and Collosus" relates the unanticipated ability of the Allies to read the encoded messages of both the German and Japanese forces which used the "Enigma" enciphering machines. Reference is made in this chapter to U.S. knowledge of Japanese intentions to attack the Pearl Harbor Naval Base. Unfortunately there was a failure to send this information to the garrison there in time to prevent the attack from succeeding.

The development of solid state devices and integrated circuits, the first solid state calculators, and transistorized radios are covered in chapter 13, along with references to computers in the United States (Eniac) and elsewhere. All told this is very useful contribution to the literature on the history of wireless.

BREADBOARDING, *continued from page 43*

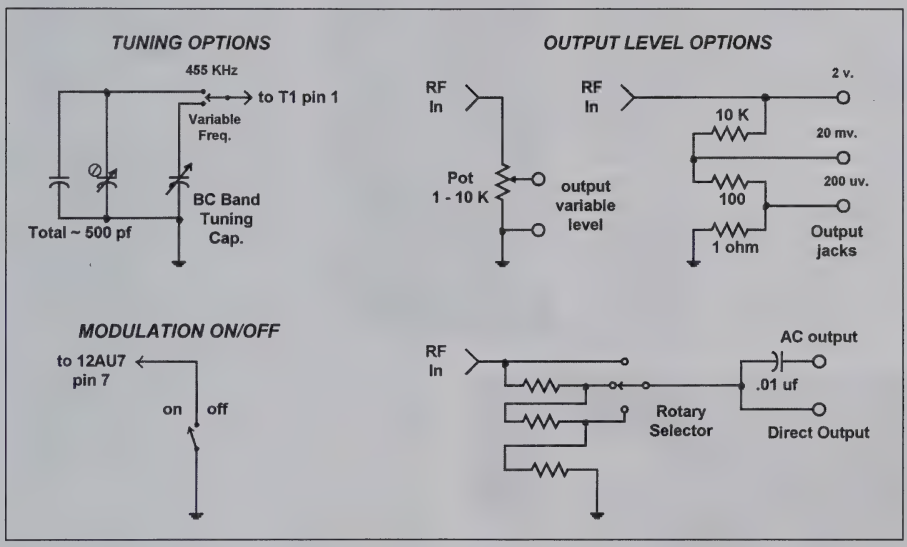


Fig. 3. Various options for enhancing the function and convenience of your oscillator (see text).

ing with. Remember loose coupling? It's generally best to use the weakest possible signal for testing, so try a short piece of wire as an antenna, radiating near the set you're working on. Or, if you have a *Photofact* for your set, you may see a reference to a "dummy antenna." That's just a few parts connected to be equivalent to a real radio antenna, but wired to an external RF generator. Simplest of all is a small value capacitor—a mica—maybe only 50 pF or less. Using this to block DC voltage, you can touch the output signal to almost any point in the RF circuitry of a receiver and get a response. If you're fixing a set, work backward toward the antenna, reducing the injected amplitude as you go. If you find a point where the response disappears, you may have found where the trouble is.

Reader Feedback

Mr. G.M.Crabtree of Lewisburg, Pa. sent me a sheaf of material on Hazeltine's neutralizing invention, including a couple of patents. Hazeltine had computed a value for tilting RF coils at an angle such that coupling between pairs of coils would be zero. Looking at my breadboard, Mr. Crabtree wondered if I had used that angle on purpose, though my coil is alone. The answer has two parts: first, I had to mount the coil somehow, and I just tried to make it as rigid as possible; second, I knew that off in the future, when someone pulled the thing off a dusty shelf, it might be recognized more quickly as a neutralizing experiment!

Next Time: Breadboarding with weird tubes!

MICS AND MEN

EDITED BY **GEORGE A. FREEMAN**, 102 E. MAIN ST., MADISON, IN 47250-3411. PHONE (812) 265-6878.
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The Mic: RCA's "Varacoustic"
The Man: Orson Welles

Both the mic and the man were distinctive. We suspect the picture[1] of Orson Welles was taken on the movie set of "Citizen Kane." This was the first film effort for the young radio star. The movie has been called the world's finest motion picture. Perhaps the "boy wonder" used the Varacoustic to address cast and crew during the filming. Of course, Welles is also well known for creating the panic-causing CBS Mercury Players broadcast "War of the Worlds," which aired on 10/30/38.

The RCA "Varacoustic" microphone was designed for public address purposes. Frequency response: 70 to 8,000 cycles[2]. The term "Varacoustic" referred to a slide switch located on the rear of the ribbon mic. This permitted switching between directional, figure 8/bi-directional, and non-directional pickup patterns.

Back of author's RCA "Varacoustic," showing slide switch (see text).

There were two versions of this mic: Model MI-6203-C was a low-impedance unit for use "a great distance from the amplifier;" MI-6204-C was a high-impedance unit. Prices were in the $67.50 range.

This microphone was manufactured in 1948, when we also saw the introduction of the famous Cadillac fins, which emulated the WWII Lockheed Lightning P-38, as well as the introduction/demise of the Tucker car. 1948 also saw the birth of a new radio format. We call it the Urban Format today. But originally the sound was referred to as "race music," then "rhythm and blues." At my radio station in Henderson, TX (KGRI-FM), in the early 1970s, we called this type of programming "Soul."

In an interesting book[3] about the birth of this format (in Memphis, TN at radio station WDIA), the cover dust jacket and other illustrations show the staff and personalities, including B.B. King, using RCA Varacoustic microphones. Perhaps that is this microphone's greatest claim to fame.

Orson Welles, possibly on the set of "Citizen Kane." (Courtesy Streamline Press).

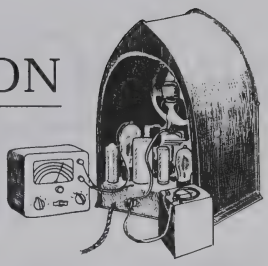
1 Picture from *Blast from the Past; A Pictorial History of Radio's First 75 Years* by B. Rhoads (Streamline Press. W. Palm Beach, FL 1996). Used by permission.

2 Source: *RCA Sound Products* catalog #218, 1948.

3 *Wheelin' on Beale* by L. Cantor. (Pharos Books, New York, 1992)

EQUIPMENT RESTORATION

EDITED BY **KEN OWENS**, 478 SYCAMORE DR., CIRCLEVILLE, OH 43113
PLEASE SEND CORRESPONDENCE DIRECTLY TO THE ABOVE ADDRESS, INCLUDING SASE FOR REPLY.



This 'N' That

Another strong recommendation for "De-Oxit D-5" switch cleaner comes from Doug McArtin, K2JJ (Yonkers, NY). He says that the Caig Co. also makes a product called "Cailube" designed for carbon controls. He has had considerable success restoring carbon pots with it. Both products are available from Antique Electronic Supply.

♦ ♦ ♦ ♦

Plug-in coil forms are getting hard to find. Alton DuBois (Queensbury NY) has devised a substitute. He uses a tube base as a foundation and PVC pipe from the hardware store for the body of the form. The pipe is about the same outside diameter as the base, so it is necessary to reduce the diameter of the pipe to fit inside the base. He uses a lathe to turn down about ½" at one end of a suitable length of pipe so it will fit snugly into the base. The pipe and base are then glued together. [*If you don't have a lathe, perhaps you can use a friend's or visit a machine shop. Either a metal or wood lathe should do. Ed.*]

♦ ♦ ♦ ♦

On the subject of restoring AK power packs, one of our far northern members has a different method. Herb Frederickson (Kemble, Ont.) puts his in the freezer (or a snowbank in winter). After a day or so, he takes it out and raps on the case with a screwdriver handle. The works fall out. [*You still have to salvage the plate choke. Be careful not to let the contents of the other two compartments fall out also. Ed.*].

♦ ♦ ♦ ♦

Richard Foster (Cochituate, MA) had an interesting experience. He restored a Philco Model 38-116 for a customer. He gave the set a thorough overhaul, alignment and bench test. A few days later, the customer called to ask if the fact that he lived in a valley would cause SW reception to come and go. Of course not, so the customer was asked to return the set.

Richard spent a lot of time trying various ideas with no luck. There was no pattern to the intermittent reception. About to give up, he turned the chassis upright to unplug it and put it aside. At that moment the reception failed and he happened to be looking at one of the IF tubes. Its filament went out, and then presently came back on. The tube had an intermittent filament; a new tube cured the problem.

♦ ♦ ♦ ♦

Mica capacitors are pretty reliable, but do occasionally give trouble. Len Aquilino, Jr. (Cicero, NY) found several in a Heathkit Model T2 signal tracer. Some were open and others very leaky. Remarkably, the filter capacitors were good in this 40+ year old instrument.

♦ ♦ ♦ ♦

Your Editor has found fewer than a dozen bad mica capacitors in 50+ years of servicing, so they are rare, but two of them were recently encountered in one week in two sets belonging to the same customer. One was a Philco Model 90 which was dead above 800 kHz. There were no shorts in the tuning capacitor. The oscillator grid voltage went to zero at this point, so the trouble was in the oscillator. The grid resistor had increased in value, which often disturbs the oscillator. Replacement extended the tuning range to 1000 kHz. Further checking revealed that the 120 pF mica capacitor coupling the oscillator plate to the tickler coil had a value of 20 pF. Replacement restored operation over the entire band. There was not enough feedback through the defective capacitor for operation at higher frequencies.

The second case involved an Arvin Model RE-91. This is a 4-tube set in a very small metal cabinet. Although it is a superhet, it does not have an IF stage. The output of the converter goes through an IF transformer directly to the

(continued on page 49)

ON THE INTERNET

EDITED BY **CHUCK SCHWARK**, 7454 N. CAMPBELL AVE., CHICAGO, IL 60645
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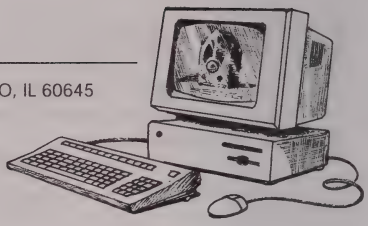


Boatanchors on the Web

I hope you all survived the holidays and have not gained inches or pounds (or kilos!). Since many AWA members are amateur radio operators, I'd like to devote this installment to antique and vintage radio equipment—affectionately called "boatanchors." Boatanchors have been given this name due to their often large and heavy construction; ranging anywhere from 30 pounds up to over 80 pounds for individual pieces.

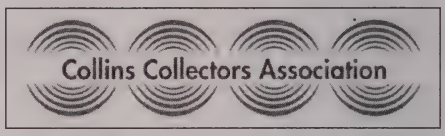
There is a lot of activity on the internet and the web dealing with boatanchors, their history, picture galleries, manufacturer on-line museums, manuals, price guides and amateur stations lovingly built up of this vintage equipment. I'm sure many of you Brass-Pounders and Rag-Chewers will have already bookmarked some of these sites, but you may just find one you didn't know about. The following links are just the tip of the iceberg when it comes to the information out there—Enjoy!

The BoatAnchor Manual Archive
http://bama.sbc.edu
by Kenneth D. Grimm, K4XL (Extra)

Manuals for boatanchors from Alliance to Yaesu. Most made up from individual contributions and scans. Also has many, many links to other resources for manuals and individuals' websites.

AC6V's Amateur Radio and DX Reference Guide
http://ac6v.com
by Rod Dinkins - AC6V

Featuring amateur and military manual resources and many, many links.



AM North America
http://www.bigcountry.com/w5ami/index.htm
by Brian M. Sherrod Sr., W5AMI (Advanced)

"A Site for the Amateur Radio Nostalgia Enthusiast Yesterday, Today, & Tomorrow." AM North America provides resources to those hams interested in the mode of Amplitude Modulation.

The R.L. Drake Virtual Museum
http://www.dproducts.be/drake_Museum/
by JM Cherry and Sindre Torp

Drake Museum, manuals, Drake catalogue, history of the Drake Line, priducts, information on Mr. R.L. "Bob" Drake and much more.

The Collins Collectors Association
http://www.collinsradio.org

The CCA is a non-profit, all-volunteer, hobbyist organization and the largest collectors organization in Amateur Radio today.

Boatanchor Pix
http://oak.cats.ohiou.edu/~postr/bapix/

A great picture website for many manufacturers like Drake, hallicrafters, Hammarlund, etc.

The Boneyard Radio Price Guide
http://home.cfl.rr.com/happysurfer/ham/boneyard.htm

Used amateur radio prices compiled from various sources. Find out the dollars-per-pound of your own sets!

W7FG Vintage Manuals
http://www.w7fg.com

Catalogues of manuals, books for sale, on-line ordering. A member of the Amateur Radio Boatanchors Web Ring.

EQUIPMENT RESTORATION, *continued from page 47*

detector. Although the set is fairly selective, it is not very sensitive and needs all the help it can get. The complaint was low volume.

The only anomaly found was a constant -5.6V on the AVC line. This voltage did not change on the strongest signal or no signal. This same voltage was also present on the oscillator grid which was normal. The diagram showed that the oscillator coil was coupled to the grid through a 50 pF mica capacitor. The cold end of the coil was returned to the AVC line instead of the usual B-. A quick test showed that this capacitor was shorted allowing the normal negative oscillator grid voltage to appear on the AVC line and cut off the tube. Replacement greatly improved the sensitivity, It's interesting that this capacitor never was exposed to more than 5-6 volts, yet still shorted.

♦ ♦ ♦ ♦

Tom Rosica, W2GIR (Batavia, NY) reminds us that safety considerations must never be neglected. The Electronic Industries Association (EIA) has a set of standards for electrical leakage

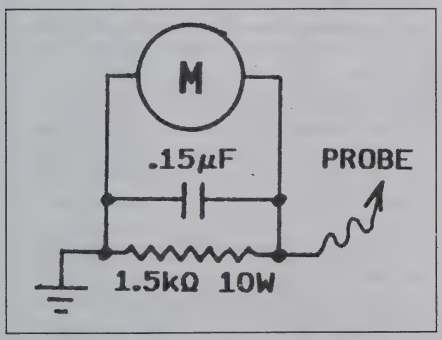


Fig. 1. Tom Rosica's line leakage tester.

from metal parts of electronic equipment. The test circuit is shown in Fig. 1. The meter (M) is any AC voltmeter having a sensitivity of 5000Ω/V or better. With the circuit connected to a good earth ground (water pipe, conduit, etc.), the probe is touched to the exposed metal parts of the set. The plug is then reversed and the test repeated.

For sets made prior to 1973, the maximum allowable voltage is 7.5V AC corresponding to 5 mA leakage current. For sets made after Jan 1, 1973, the maximum is 0.75 V AC corresponding to 0.5 mA leakage. Any values in excess of these limits indicates a potential shock hazard and *must* be corrected.

♦ ♦ ♦ ♦

Sidney Boots, KF6QVB (San Jacinto, CA) gives an interesting account of restoring a "mystery" set.

"What to do with an old radio with no tubes and no schematic? The only identification was the name "PLA-MOR" on the front and a tag on the back reading "Made in USA by D.R. Co., Detroit. B255926".

It was a series string set with 5 tube sockets. By tracing the wiring, I determined which was the rectifier socket. From the tube manual, I found that a 25Z5 fit the socket and wiring. This gave a starting point; the rest of the tubes would have to have 300 mA filaments. I then consulted Beitman's *Most Often Needed Radio Diagrams, 1926-38* for typical sets using a 25Z5. The next tube appeared to be a 43 which agreed with the socket wiring. The remaining tubes could be 6C6 and/or 6D6 [*Or 78/79. Ed.*].

The remaining position was an octal socket, but there were no octal tubes with the required filament current rating. It then occurred to me that this socket was for a ballast tube needed for series string operation of the other 4 tubes. Not having any ballast tubes, I made up one consisting of the calculated value of wirewound resistor mounted on an octal base with a homemade perforated metal shield.

I had all the other tubes in stock. After replacing most of the capacitors, I inserted the tubes and fired up the set. The total current draw was 350 mA, and I immediately got 2 or 3 stations. I made a loop antenna of 140 turns on a 18" form which I can rotate for best reception. The old line cord was replaced with a polarized cord for safety. If you work at it, almost any set can be restored.

BY FRANK J. LOTITO K3DZ

A CW KEYING INTERFACE CIRCUIT FOR OT AND CLASSIC TRANSMITTERS

Now that you are a bit older, do you find it very tiring to send CW, at a reasonable speed, with a hand operated straight key or mechanical keyer? Would you like to use your modern keyer to key your OT or classic transmitter, but worry—with good reason—that it might damage your keyer's output circuit? If the answer to one or both of the above is yes, you might like build this easy-to-construct, junk-box-friendly, circuit. It will safely interface your modern solid state keyer or keyboard with a wide range of OT and classic transmitters.

The Problems

The modern keying device's output circuit is voltage and current limited. A solid state keyer, be it an iambic hand operated keyer, keyboard keyer, or a TNC (terminal network controller) is typically designed to key only solid state transceivers. For the "key down" condition, the modern transceiver requires bringing a rather low positive voltage to ground potential. The modern transceiver's "key up" voltage is typically 5 to 12 VDC. The "key down" current is usually less than a few milliamperes.

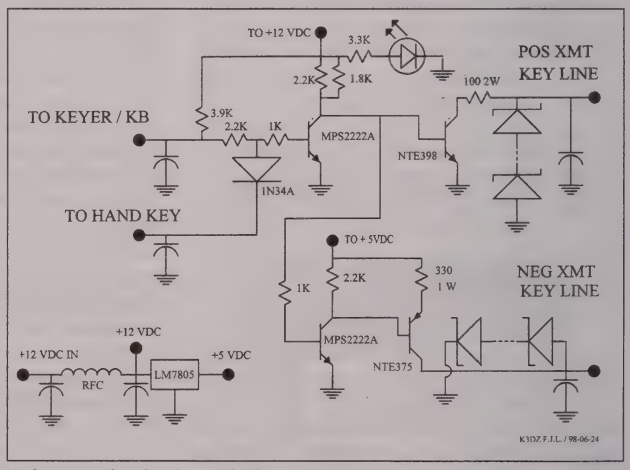
The OT or classic vacuum tube transmitter may present "key up" voltage in excess of 100 VDC for a cathode keyed transmitter. In negative key line transmitters (grid blocked keying) the "key up" negative voltage may exceed 60 VDC. The "key down" current at the keying jack of a cathode keyed transmitter may be a few dozen mA for a low power rig to well over a few hundred mA for a high-powered rig. The grid-block keyed transmitter's "key down" current at the keying jack is usually less than 5 mA.

There is one other problem with the OT or Classic transmitter: the worse-case fault condition. A fault might mean subjecting the solid state keyer's output circuit to hundreds of volts and/or thousands of mA! The modern keying device will definitely not tolerate an insult of this magnitude to its output circuit.

The Solution

Look at the schematic for the circuit. Basically, it is the solid-state equivalent of the electromechanical relay. Why not just use a conventional "electromechanical" relay? that would definitely work if you could find a relay adequate to follow the maximum desired keying speed. Not all relays are suitable.[1]

The device may be too slow in responding to a make/break command. It might have contacts that cannot tolerate the required voltage/current.

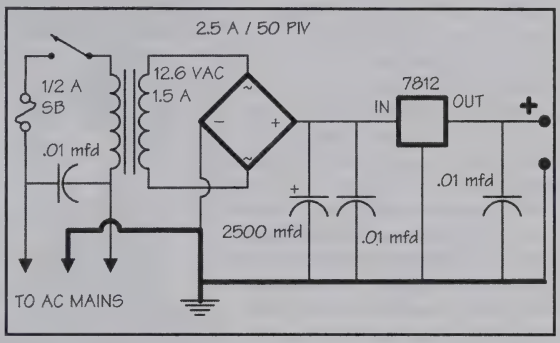


Schematic for the OT and Classic Transmitter Keying Interface. All capacitors are .01 uF ceramics. See text for Zener diode specs.

1428 O'BLOCK RD., PITTSBURGH, PA 15239 — E-MAIL: K3DZ@AOL.COM

The contacts might "bounce" or make an unacceptable amount of acoustical or mechanical clatter (unless housed in an appropriate acoustic/shock mount enclosure). That's why I opted for a "modern" solid state approach, even though that might seem odd for someone who prefers to use OT and classic rigs rather than modern transceivers.

My interface can, if necessary, simultaneously key the cathode and grid blocked keying line of a transmitter. For example, I simultaneously key a "modified" Heath VF-1 VFO and DX-60 transmitter. Otherwise, the on-the-air back-wave would be unacceptable.[2] Both the negative and positive keying line outputs are zener protected for overvoltage, and moderate worse case faults.



A simple dedicated power supply you can include on your interface circuit board.

Choosing Zeners and Output Transistors

Note the series-connected Zener diodes used in the positive and negative Xmit Key Lines. These must have a "peak" current rating that could handle peak current discharged during a worse-case fault. The components I chose would definitely are not able to survive a worse-case fault from a high-powered transmitter. However, they are suitable for low-powered OT '29 QSO Party cathode-keyed rigs such as the TNT, Hartley, MOPA, etc., and for classic grid blocked keyed transmitters such as the Heathkit DX-60 and HW-101, Collins S-Line, etc.

I used 12-volt, 1-watt zeners connected in series. They are inexpensive and easy to find. The zener voltage must be greater than the "key up" voltage required to turn off the transmitter. And the collector-to-base voltage rating of the keying line output transistor must be greater than the zener voltage.

For example, a DX-60 may require as much as -65 volts at key up to turn off the transmitter. To handle that, I selected Zeners with breakdown voltages over 65 VDC—but less then 75VDC, which is the collector-to-base rating of the PNP transistor (MPS2222A) I used in the negative keying line. A better design would have been to use a PNP transistor rated at 120 volts, and 75 to 85 volts worth of zeners.

A side benefit of the zener stack at the positive keying line output is that it provides overvoltage protection of the keyed stage's filament-cathode insulation. Damage to the filament-to-cathode insulation is frequently overlooked when keying a tube with a cathode having one of its filament leads grounded[3] For example, without zener protection, the cathode to ground "key up" voltage for my 6F6 single tube QRP crystal oscillator transmitter measured 110-130 VDC. (I measured this with an 11-megohm input resistance VTVM. On my 10,000 ohms-per-volt VOM—using the 150-volt scale, which has an input resistance of only 1.5 megohm, I read a little less than 90 VDC!) I found that a 75 volt zener stack was adequate to assure that the 6F6 transmitter turned off during "key up." But before I installed the zener protection, the 6F6 developed a heater to cathode short within a few hours operating time![4]

Additional Design Information

• The interface design can be easily powered by a common low-current 12 VDC power supply, or even a 9-volt transistor radio battery (NEDA 1604A). Power supply current at 12 VDC is 20 mA at key up and 32 mA at key down. A "fresh" 1609A battery at room temperature may get you 8 to over 16 hours operation.

• If desired, high-powered cathode-keyed transmitters can be connected to the interface so long as the positive keying line output transistor and current limiting resistor are properly chosen. The resistor in series with the keying output line limits the "worse case" short circuit current should a fault develop. The possibility of a high current fault in a cathode keyed power amplifier should prompt you to use a wire wound resistor

rated at least 5 times the expected normal operating $1/2\ I^2R^5$. The peak current in a fault is voltage divided by resistance, less the effects of series inductance or shunt capacitance. A practical power rating for this resistor might be 10 watts or more.

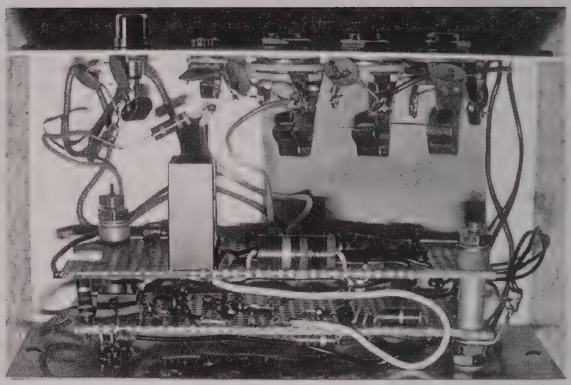
• The positive keying line series resistor produces additional cathode bias. The transmitter's cathode-keyed stage's grid-cathode bias voltage and/or cathode resistance may have to be reduced in magnitude due to the effect of the interface's built in keying line series resistor.

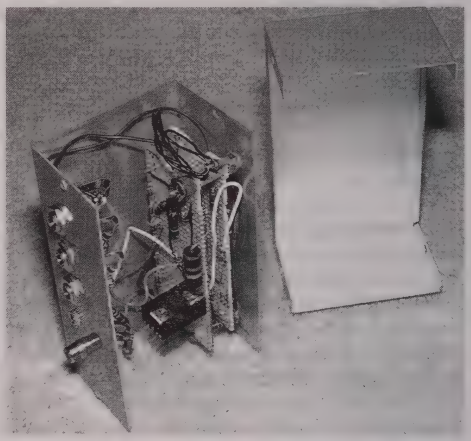
• Choose high beta (current gain) transistors. High beta transistors are easy to drive to the extremes of cut-off and saturation. It is important that the all the interface circuit's transistors be driven hard into these two extremes. If not, the transistor's voltage drop at key down may present a non-repeatable bias to the keyed tube.

• The keying output line series resistor and its by-pass capacitor(s) play a role in determining the shape of the transmitted signal's "keying envelope." In general, softer keying will be produced as the RC product of the output circuit's series resistor and shunt capacitor increase.

• There are many sources for appropriate voltage- and current-rated keying line PNP and NPN transistors. Mine came from a junkbox stash of "vertical and horizontal sweep circuit pulls." (The solid state equivalent of the sweep tube.) I collected these during many years of cannibalizing TV sets that I found "patiently waiting for me" at the curb during trash day. Make sure the keying line transistor's collector to base voltage comfortably exceeds the maximum desired keying line key up voltage, and the transistor's maximum pulse current rating equals or exceeds the worse case fault current. Some popular transistor interchange manuals contain details on these important transistor parameters.[6]

• There is nothing critical about the construction of the interface. Mine is housed in a 2" high by 3" wide by 5" long aluminum mini-box. I used 1/4-inch RCA phone jacks for the keying lines, an RCA phono jack for the 12 VDC power supply input, and a 1/8-inch phone jack connection to my electronic keyers and keyboard's keying line. Wiring is "dead bug construction" on vector board. By all means, if you have the ability, make an etched circuit board.





Two views of the completed keyer now in service at my shack.

• I use an external 12 VDC power supply to simultaneously power a number of low voltage station accessories, including this keying interface. But there is no reason why a power supply could not be included as part of this interface assembly. I'm including a schematic for a simple low-parts-count regulated 12 VDC power supply that can be built into the interface. The 7812 series 3-terminal linear integrated circuit regulators shown is more than adequate for this use.

A word of caution: If you opt for a keyboard, have mercy on the station operator on the other end! Even the time honored "hunt and peck" two fingered typing method can easily rocket your sending speed over 25 WPM!

NOTES

1 The electromechanical relay definitely offers the advantage of simplicity if you want to

(continued on page 54)

About Our
Feature Article Authors

WILLIAM B. FIZETTE
A Structured Approach to Fixing Up Those Nice Old Radios

Bill is AWA's current president as well as Editor of *The OTB's* "The Communications Receiver" Column. His bio appears in the February, 2000 issue.

GEORGE FREEMAN
Remembering Ross Smith

George Freeman's broadcasting career spans almost half a century. In his earlier days, he served as DJ, staff announcer, news director, news reporter, account executive and general manager at stations in Ohio, Pennsylvania, Connecticut, and New York. Recently, he sold the last of a string of six radio stations that he owned and operated: WIKI-FM (Madison, IN/Carrollton, KY); WDGS-AM (Louisville, KY); KGRI-AM and KGRI-FM (Henderson, TX); WQXO-FM and WGON-AM (Munising, MI)

George is an avid microphone collector and enthusiast. He also has a large collection of photographs showing mics from different eras being used in actual situations. Most of you know him as the author or our new and popular "Mics and Men" column. George serves as Vice President of the Indiana Historical Radio Society.

CHARLES C. KIRSTEN
"Obsoleting" a Vintage Tube Tester

Charles is a retired spacecraft electronics engineer, and was employed for over 40 years in electronics research and development (including 26 years at the Jet Propulsion Labs in Pasadena, CA). He repaired radios at age 12, completed a Pratt and Whitney Toolmaker's apprenticeship at age 17, and received Navy Radar training during Word War II. He holds BS and MS degrees in electronics from UCLA. His primary contributions in the field of electronics have been in spacecraft telemetry and science instrumentation.

Charles finds the challenge of restoring antique radios and electronic instruments satisfying as well as nostalgic. He derives much pleasure from the beautiful jewelled meter movements and expressive speakers which give life to, and evidence of, the electric currents we can't see but try to control.

DAVID W. KRAEUTER
Selected Patents in Electronics

David Kraeuter was born in Homestead, PA in 1941. He holds an M.L.S. degree from the University of Pittsburgh. He has edited the Pittsburgh Oscillator and the monograph series of the Pittsburgh Antique Radio Society.

Since the 1980s he has been interested in making the vast wealth of information buried in national patent publications more accessible to the public. He thinks he has made a beginning in this work with his latest book, Radio Patent Lists and Index, 1830-1980, to be published by the Edwin Mellen Press in May. In 620 pages he tabulates and indexes 6,200 U.S. and British patents issued to 100 radio and television inventors.

With radar pioneer and writer G. W. A. Dummer of the UK, he is now working on the 5th edition of *Electronic Inventions and Discoveries*, a chronology of electronic firsts from the 17th century to today. The book is to be published by the Institute of Physics Publishing, London.

FRANK J. LOTITO, K3DZ
A CW Keying Interface Circuit for OT and Classic Transmitters

Frank has a BS in electrical engineering, but for most of his 30-plus working career has primarily done mechanical engineering from a quality point of view for a large international safety equipment company. He has held the call K3DZ for over 20 years, and also possesses an FCC General Phone license with radar endorsement.

He has been a home brew enthusiast from the start of his interest in amateur radio. His projects have run the gamut from modern solid state VHF and UHF FM synthesized transceivers to designs going back to the early 20s. Frank is most definitely a strong proponent of the "file to fit—fit to file" use whatever you have in your junk box school.

DONALD F. MCLEAN
Playing Back the Earliest Known Video Recordings

Don has been working in industry ever since graduation from the University of Glasgow in 1975. He has been deeply involved in the development of advanced computer systems, and

managed a division of Logica UK Ltd for over three years. After 13 years with Logica, he joined Hewlett Packard in 1996 as a Principal Consultant, looking after HP's professional services interest in the Royal Navy. He later played a key role in the development of HP's e-business activities. Today, he is European Director of a Consulting Practice with EDS UK Ltd. He has been interested in early television for many years. More information on the work touched on in his *OTB* article will be found in his Book *Restoring Baird's Image*, recently published by the IEE. In his spare time he enjoys family geneological research and amateur astronomy.

JAMES P. RYBACK, W0KSD

Pre-1930 Color Television

James Rybak was born in Cleveland, Ohio in 1941. He has been interested in both radio and electronics, first as a hobby and then as a profession, for over 40 years. Jim holds B.S., M.S., and Ph.D. degrees in electrical engineering as well as Extra-Class amateur radio license W0KSD. He teaches engineering and mathematics at Mesa State College in Grand Junction, Colorado. In recent years, Rybak has published numerous articles in the U.S. and abroad on the history of both wireless and electrical technology. When not writing articles, he spends his free time trying to achieve "Worked All States" through the low-earth-orbit amateur radio satellites as well as trying to become knowledgeable about digital photography and slow-scan television.

LANE S. UPTON

The Rejuvenation of Vacuum Tubes

Lane began to repair radios, part time, for Montgomery Ward while still in high school. Because of the WWII manpower shortage, he actually received high school credits for the radio job. In 1946, he obtained a First Class Radiotelephone License. Later, as he continued his education, he worked in commercial radio and public address, then in early television. He owned a television service business in 1953/1954.

Moving into industry soon after that, he joined Kaar Engineering, Palo Alto, California, as a communications receiver/transmitter design engineer. In 1960, he became a principal in Delcon Corporation, an electronics firm specializing in communications equipment. Delcon was later acquired by Hewlett Packard. In 1962, Lane joined Eimac, later to become Varian, as a process and test equipment engineer. His first assignment was a 4 MHz, 1 megawatt CW test set. Transferred to the Salt Lake City plant in 1964, he designed the "new to Eimac" x-ray test/process equipment in 1970. He has been collecting radios and laboratory grade electrical test equipment since 1968 and took early retirement in 1987. Lane has been an AWA member since 1970.

CW KEYING INTERFACE CIRCUIT, *continued from page 52*

key the transmitter's plate voltage. In this case, relay speed is not that important since the slow charge/discharge rate of the transmitter plate supply filter inhibits high speed CW.

2 The VF-1 is cathode keyed; the DX-60 is grid blocked keyed.

3 It may not be possible to let the filament transformer secondary winding "float" and key the secondary winding's center tap (or key the geometric center of a resistor string connected across the transformer's filament winding). The transmitter design may have returned one side of each tube's filament directly to chassis ground.

4 Examples of min/max filament to cathode voltage:

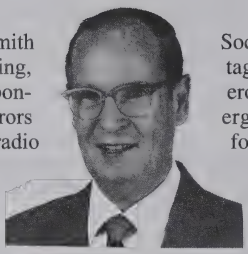
RCA Tube Manual #	Tube	Min/Max Heater to Cathode Voltage
RC-22	6F6	+/- 90 V
RC-22	6L6 metal	+/- 180 V
RC-22	6L6-GC	+/- 200 V
RC-22	6DQ5	+/- 200 V
RC-22	6CL6	+/- 100 V
TT-5	807	+/- 135 V
TT-5	6146	+/- 135 V

5 The fraction 1/2 is because CW is roughly 50% duty cycle.

6 The list below represents a few transistor interchange manuals. These manuals, as well as others are available through electronic parts distributors and also frequently found at hamfests. One can be downloaded from the Web:
Archer Semiconductor Guide (Radio Shack)
NTE Semiconductor Technical Guide and Cross Reference
Sylvania ECG Semiconductor Master Replacement Guide
General Electric Replacement Semiconductor Cross Reference Guide. Also visit http://www.nteinc.com for cross references and individual data sheets

BY GEORGE A. FREEMAN, VICE PRESIDENT, INDIANA HISTORICAL RADIO SOCIETY (IHRS)

REMEMBERING ROSS SMITH



Ross Smith

Twelve years ago, when Ross Smith told me what he did for a living, my jaw dropped. It was his responsibility to seek out and cure design errors in new production models of major radio manufacturers. Based on his evaluations, his employer ordered inventory to correct mistakes of the best engineers in the radio business. Ross' employer, CTS Corp., would provide the parts, replacements, and re-works through the model year. The following year, when America's leading manufacturers unveiled their proud new product lines once more, Ross sized up their goofs all over again.

If you are thinking Ross had to be better than the best, you are correct. Officially, Ross Smith was manager of quality control and director of the CTS testing laboratory in Elkhart, IN. He served the company for 43 years and retired in 1983. He retired officially, but not actually. He volunteered to be the curator of the CTS-Turner Museum.

A dozen years ago, Ross nurtured the idea of a vintage radio/TV museum in southern Indiana suggested by the writer. Hopefully, Ross' mentoring will be manifest in 2002 with the writer's opening of just such a museum combined with lodging in the heart of downtown Madison, IN. In recent years Ross had been an early and consistent supporter of the IHRS Museum in northern Indiana at Ligonier.

Over the years The Indiana Historical Radio Society, America's first regional vintage radio club, benefitted from generous contributions of Ross' time, energy, and talent. He was one of the founders of the organization, helped to lead it, and supported it every month of every year. He was also a charter member of the Antique Radio Club of America, now merged with AWA.

It was his long term, consistent involvement that set Ross apart from many. He was a member of the CTS Quarter Century Club. He also wrote AWA and IHRS columns for years, covering transistor radios and topics. Ross was a member of St. Paul's United Methodist Church, YMCA, Vintage Automobile Club, Christian Businessmen's Committee, and the Mr. And Mrs. Club.

AWA was enriched by hundreds more of Ross Smith's efforts. He conducted seminars, was a valued contest participant at the annual conference, and invariably took pictures of many events. He'd distribute copies of these pictures to participants for months after each of the AWA and IHRS events. Ross joined other AWA members attending two meets in England.

He was a very high achiever with a sometimes self-deprecating sense of humor. Always a consistent first-place blue ribbon winner and often best of show recipient, Ross received a second place ribbon from the judges at the last IHRS old equipment contest where we both competed, "I like red!", he said.

Charter members of IHRS in 1973. Ross is at right; Ed Taylor is third from right; Jim Fred is second from left.

And Ross was lucky. He married Wava Rose Williams on June 8, 1941. She has been a constant participant in all the vintage radio goings-on. Wava Rose has won a few vintage radio contests too. Two Hoosier children, a son and a daughter, survive, along with three grandsons, two great-grandsons, a brother and a sister. Ross Smith died in the Elkhart, IN hospital on July 24, 2000. He was 82.

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EDITED BY **FRANK LOTITO, K3DZ**, 1428 O'BLOCK RD., PITTSBURGH, PA 15239

PLEASE INCLUDE SASE FOR REPLY.

LF/MF Communications Equipment Aboard USS *Ling*

By Howard F. Holden WB2AWQ

This article represents an extraordinary blend of talents from within an amateur radio association and an organization attempting to preserve the history of the US Navy. No doubt with perseverance these committed workers will be able to totally restore a very interesting and important part of naval and radio communications history. Hats off to their dedicated effort!—F.L.

For almost two years members of the 10-70 Repeater Association, Inc. of NJ have been working on restoring radio and other electronic equipment aboard the WW2-commissioned submarine USS *Ling* (SS-297). The *Ling* is berthed at the NJ Naval Museum in Hackensack, NJ[1]. Of particular interest to this column is the LF/MF equipment aboard the sub. The main items used (as in most other Balao class submarines) are the RAK-8 and RAL-7 receivers and the TBL-12 transmitter, or various series of the same gear. The LF/MF gear would have been used to monitor the 500 kHz international distress and calling frequency and for communications with Coast Guard and commercial stations as required.

Most Navy shore stations maintained a "guard" (dedicated transmit and receive) on 500 kHz, plus a frequency close to 500, as well as on various US Navy operations theater or worldwide working frequencies. The US Navy normally used LF/MF for weather, navigational, and distress purposes, not for regular message traffic. Commercial vessels, on the other hand, regularly used 500 kHz as a calling frequency, and moved to other frequencies within the LF, MF, and HF bands to pass traffic.

The RAK/RAL receivers are unusual for the period because they are TRF (tuned radio frequency) receivers with a regenerative detector. Performance is excellent considering their 1930s design. They are classified as "radiation safe," that is, oscillation from the regenerative detector cannot be readily detected outside the sub.

The receivers use only six tubes, 4 each 6D6 and two each #41 pentodes. The RAK receiver tunes 15 to 600 kHz in six bands, and its MF/HF brother the RAL tunes 300 kHz to 23 MHz in

Visitor's entrance to USS Ling at her museum dock.

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nine bands. Neither the RAK nor the RAL receivers are lightweight units. The receiver without power supply weighs around 75 pounds. A look at the interior of one shows why. These babies are built like the proverbial battleship.

The front panels each boast no less than 12 controls, and there is also a filament voltage meter and an audio output meter. The receivers drive headphones directly, or feed a control box that allows the operator to listen to either the RAK or the RAL, or both simultaneously. There is a separate power supply for each receiver. Each power supply weighs 43 pounds. The power supplies use three tubes, a 5Z3 full wave rectifier and an 874 regulator (*Ed.—similar to the VR90, but with a 4-pin base*), and one #876 ballast tube[2].

The RAK has not yet been restored to operation; the RAL gives a fine account of itself on HF, but suffers from severe BC overload on the lower frequency ranges. It even does a creditable job on SSB signals, once one gets used to juggling the regeneration control along with the main tuning. Typically one wants the regeneration control just over the point of oscillation, which happens to offer the best beat reception selectivity (highest tuning Q). The frequency vernier control can be used to fine-tune SSB signals, as any change in the regen control will also change the detector/oscillator frequency.

The RAK is designed to operate with an antenna tuning system that is intended to compensate for the relative shortness of the submarine's antennas on VLF and LF, while the RAL operates directly off the antennas. The long-wires are each about 80 ft long, and run from the sides of the conning tower to the bow, where they are supported by a T-mast. Any point along the antenna wires is at best 10 feet off the sub's main deck!

The antennas exit the radio room through a dome in the overhead and an eight-foot-tall watertight shaft. They exit the through two insulators protruding through the bulkhead.

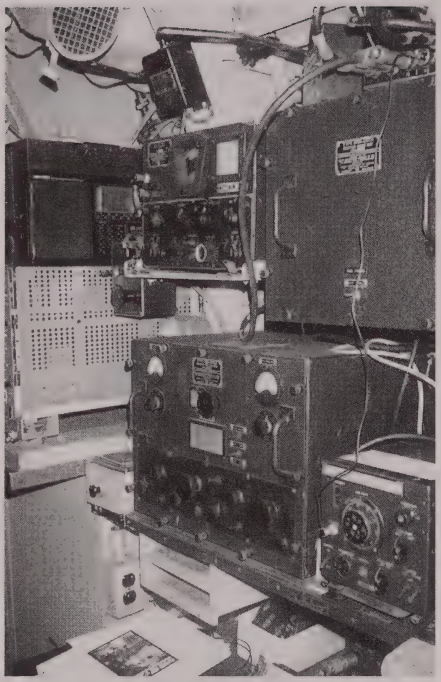
We can hear a number of signals below 535 kHz on the RAL (which tunes down to 300 kHz). Navtex (an automated mode B SITOR)[3] transmission of weather and hydrological information for ships) on 518 kHz is very strong. These signals are broadcast from the US Coast Guard in Boston, MA and Portsmouth, VA among others. We can also hear several airport marker beacons in the NYC metro area, plus some other unidentified digital signals, one around 487 kHz, and one near 400 kHz.

Due to the demise of most maritime operations on the former international distress and calling frequency by virtue of GMDSS, there is very little maritime activity below 535 kHz. Compared to past years, 500 kHz is eerily quiet. However, given how well we receive Navtex, there is no doubt that 420-510 kHz would have been received very well on the RAL.

Bill, KC2BLN, operating in the radio room. Just behind him, hidden by the radar shaft housing, is the TBL transmitter.

The US Navy still uses VLF (in the 16 to 28 kHz region) to broadcast traffic to subs using very narrow-shift RTTY (on the order of 50 Hz or less). When I was a CW operator in the Navy (NGR and NAW, 1966-1970) we had a VLF submarine broadcast on 21.6 kHz using a 200 kW output transmitter.

The VLF range carries quite deep below the salt-water surface (*Ed.—This was known during the WWI era.*), but we have no record of the *Ling* using its VLF radio while submerged. US Navy VLF broadcast stations use power levels up into the megawatt range. In recent years, there has



The RAL receiver is at center of the picture with the LM-18 to its right. RAL power supply is above the LM-18, and the RAK is out of the picture just to the right of the LM-18.

been a shift to satellite systems, even for subs, using very specialized equipment. These techniques may soon spell the end for the few remaining Navy VLF stations.

The TBL transmitter (serial #127) on the USS *Ling* was manufactured in 1943 by Westinghouse in Baltimore, MD. This behemoth weighs in at some 700 pounds less power supply, stands six ft tall, and is about 40 inches wide and about 18 inches deep. Inside this massive housing are two separate variable frequency master oscillators — one for MF and one for HF.

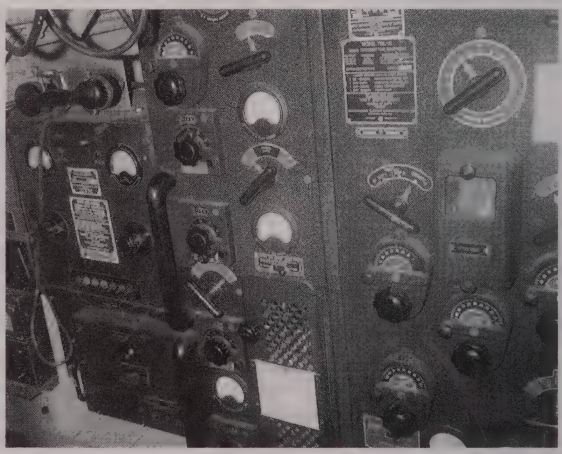
The transmitter covers from 175 to 600 kHz and 2 to 18 MHz in a total of 14 bands. It uses #860 power tetrode tubes for the master oscillator, one for an intermediate amp covering both ranges, one for an audio oscillator, which "chops" the RF signal at an audio rate. This makes the chopped signal audible on any receiver. The chopped signal is called ICW, or "interrupted continuous-wave" mode, and is applicable only to the 175-600 kHz range.

The RF amplifier uses a pair of #803 power pentodes, rated at 150W dissipation for each tube. The official power rating for the TBL is 200W output on CW, 100W on ICW, and only 50W on suppressor-grid modulated AM phone. According to documentation found with the boat, RF power output actually ranged from over 500W CW output at the lower end of its frequency range in CW mode, to about 75W output on AM phone near the upper end of its range at 18 MHz. The TBL is designed to work directly into the sub's wire antennas. This submarine has no transmitting equipment for frequencies below 175 kHz.

The TBL uses a 50064 external modulator unit to suppressor-grid modulate the 803 RF power amplifier. The 50064 modulator provides transmit-receive control and just 3W of audio, and weighs 77 pounds! The transmitter can be accessed on voice locally in the radio room, or from the conning tower, via telephone handsets which are connected to the modulator and to the RAK / RAL receiver system.

As with the RAK and RAL receivers, the TBL transmitter is a testimonial to battleship construction. The craftsmanship is superb, the controls all very smooth and solid. Each MO tuning dial is normally freewheeling. The tuning dials must be manually engaged to change frequency. This was done to eliminate accidental frequency shift.

Like all the radio equipment, and most other equipment aboard the sub, the TBL is designed to fit through the watertight hatches. These



TBL transmitter at right of picture. Under handset at left is 50064 modulator with its power supply installed beneath it.

hatches are about 20 inches wide, 36 inches tall, rounded at top and bottom. The transmitter is constructed as a two-piece unit, splitting vertically. It may indeed fit through the hatches, but I am wondering WHO they got to actually lift that beast once it was inside the very cramped quarters of the submarine!

The *Ling's* TBL is presently not operational because it is powered from a motor-generator set that runs off the sub's 230 VDC battery buss. The condition of the buss is unknown at this time, and the motor draws some 50A at startup, which means we would have to provide some fancy rectified 220VAC down there.

Before applying any power, we will also have to prove out all of the HV lines with a megger to ensure they are safe after 55 years. The generator provides 2000VDC, 1000VDC, and 77VAC to the TBL. Restoration of the TBL is still some time away, although cursory examinations of its interior show it to be in excellent condition.

From the tuning setting cards found on the equipment the following frequencies below 535 kHz were in use:

500 kHz	TX and RX old international distress and calling frequency
450 kHz	TX and RX
434 kHz	TX and RX
422 kHz	TX only
355 kHz	TX and RX
194 kHz	RX only (call letters TUK listed, location unknown.)
190 kHz	RX only (call letters NMF listed, this frequency is the US Coast Guard, Boston MA)

The TX and RX frequency pairs other than 500 kHz are probably Navy simplex working frequencies, while the TX only and RX only frequencies, except 190 kHz, are probably commercial station frequencies. Typically, the Navy used single frequencies for CW traffic, while commercial stations used split frequencies for full break-in operation. The information found on the sub is very scanty. We have not located any radio logs, and the deck logs don't list actual frequencies or shore stations used, nor do we know what time period or stations, other than TUK and NMF, the equipment setting cards represent.

One very essential piece of equipment required to operate both the TBL transmitter and the RAK and RAL receivers is the LM-18 heterodyne frequency meter. The LM-18 is similar in operation to the more common BC-221 Army frequency meter. The LM-18 aboard the USS *Ling* has been restored, is fully operational, and complete with a painstakingly reconstructed calibration table. Both the TBL and the RAK / RAL units have no direct frequency readout, only dial log numbers. Hence the need for the LM-18. The LM-18 is a small unit, about 9" × 9" × 9", with its own separate AC power supply. Surprisingly, the LM and its power supply are relative lightweights, only a few pounds each!

The USS *Ling* radio room is an intensely crowded place, with barely room for two persons. Bringing this old gear back to life in these tight quarters is most definitely a task! As we worked on the equipment we frequently found our minds wandering. We tried to imagine what it was like in 1945, the closing year of WW2 when the *Ling* was heading out to the Pacific Theater on it's first war patrol.

Radio operation aboard the *Ling* is alive and well today. The 10-70 Repeater Association[4] recently established a HF setup in the radio room using a "modern" Yaesu FT101-ZD transceiver. We can often be heard, usually on Saturday mornings between 10 a.m. and Noon Eastern local time, around 7043 kHz and 14043 kHz CW, or around 7243 kHz and 14243 kHz SSB.

The call sign is N2SE, (which hopefully will become NX2ND, after the boats' original Navy call sign NXND). The 10-70 repeater Association offers a colorful postcard sized QSL for contacts made (please, request the card with a QSL and SASE). Plan to visit the USS *Ling* if you are ever in the Northern NJ area. The NJ Naval Museum/USS *Ling* is open Saturday and Sunday year-round except on major holidays.

The above information is as factually correct and accurate as possible, given our information sources. If you have questions, corrections, or stories concerning LF/MF operation aboard WW2 submarines, and specifically the USS *Ling*, we would like to hear from you!

[1] See http://www.njnm.com/ for additional information on the New Jersey Naval Museum and a virtual tour of the *Ling*.

[2] A. P. Jacobi, *The Ballast Tube Handbook*, Feb 1991, published by Antique Electronic Supply, Tempe, AZ, page 54, and *The ARRL Radio Amateur's Handbook*, third edition, first printing, October 1927, page 78.

[3] SITOR is the commercial equivalent of AMTOR, or "Amateur Teleprinting Over Radio," and mode B is the FEC or "forward error correction" method, used in one-way SITOR or AMTOR transmissions.

[4] See http://www.10-70.org for additional information on the 10-70 Repeater Association and its work on the USS *Ling*.

BY LANE S. UPTON

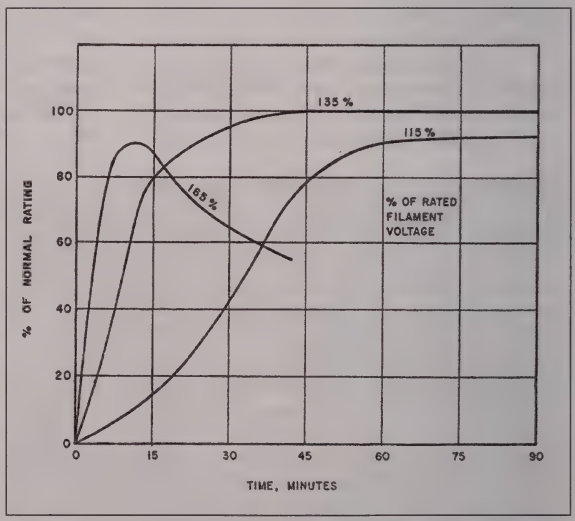
THE REJUVENATION OF VACUUM TUBES

This article on tube rejuvenation originally appeared in the December, 1973 OTB. *Over the years, Lane has received so many requests for copies that he suggested we reprint it. I agreed and here it is!—MFE*

With the ever increasing scarcity of the old tubes, it is becoming more important that we try to save as many as possible. Over the past two years the author has been experimenting with the rejuvenation of these older tube types. This work has been based primarily on present day techniques used at Eimac and on data given in various books published during the 1920s. Using the methods described herein, the author has had approximately 85% success in returning inactive tubes back to useable transconductance. The failures have primarily been due to filaments being burned out during the application of the excessive voltages required. The tubes which failed either had filaments that had been weakened from long hours of operation, or were marginal at the weld joints. None of these failures were opened for investigation as they are still valuable for display purposes.

The main reason many of these older tube types become unusable is a loss of electron emission from the filament or cathode. With the wide inter-electrode spacings used in these tubes, a short is very rare except in the case of a broken filament or grid wire, or where the oxide has flaked from the filament or cathode and has touched the grid. The loss of electron emission typically shows up in the tube tester as a "weak" reading or even failure to raise the meter needle at all. If a tube tests normal and does not show any erratic indication on the test meter, no attempt should be made to improve it by rejuvenation.

The equipment required for rejuvenation is relatively simple. In addition to a tube tester, a variable filament supply is required with a meter of reasonable accuracy for measuring the applied voltage. In place of a separate filament supply, a filament voltmeter may be connected to the tube tester and the filament voltage switch and "line" adjustment used for voltage control. For the thoriated tungsten filaments ***it is preferable that no grid or plate voltages be applied during rejuvenation***. With an oxide emitter tube, voltages should be applied during rejuvenation. The removal of plate and grid voltages can be readily accomplished by the construction of an adaptor socket with filament connections only.



Summary of data accumulated by author on rejuvenation of thoriated tungsten filaments, Best results are obtained at 135% of rated filament voltage. At 115%, rejuvenation time is very significantly increased; at 165%, the tube is quickly destroyed.

3788 S. LORETTA DR., SALT LAKE CITY, UT 84106 • E-MAIL EIMACER@AROS.NET

The voltage applied to the filament during rejuvenation must be carefully controlled to the values given herein. The accompanying graph shows the results of various voltages applied to a thoriated tungsten filament during rejuvenation. It shows that a voltage lower that the recommended value will eventually result in a fairly good tube, while too high a voltage will result in a tube which will remain weak.

Emission loss is generally due to contamination (poisoning) of the emitting surface. The vacuum and the original outgassing of the elements in these older tubes was not near the present day standards, therefore they contain considerable residual gases. The poor emission usually is the result of (1) the emitting surface having been poor prior to storage, or (2) the filament/cathode having been poisoned immediately on being heated by the residual gases which had condensed on the emitting surface. The function of rejuvenation is to drive off these condensed gases and to replenish the electron emitting layer on the surface of the filament/cathode.

Vacuum tubes have essentially three basic types of emitters. These are: pure tungsten, thoriated tungsten, and directly or indirectly heated oxide. The type of emitter in a given tube can be determined by its operating color at rated filament voltage. The pure tungsten filament operates bright white, the thoriated tungsten filament runs orange to yellow, while the oxide emitter operates in the dull to bright red region.

The pure tungsten filament needs little reactivation as its operating temperature makes it self cleaning. Operation at 110% of rated filament voltage for up to 30 minutes should clean up any residue. This type of filament was used in such tubes as the UV200, UV201 and in many of the early transmitting types.

The thoriated tungsten filament is probably the major one to be dealt with by the collector. This filament is a composition of tungsten and thorium, with the tungsten acting as the heat source while the thorium is the emitting source. This filament was used in tubes such as the UX200A, UX201A, UV/UX99, UX120 and in many of the later (and present day) transmitting tubes. Two methods are used for rejuvenation of these filaments. If a tube is only weak or gives erratic readings, the first of the following procedures should be tried. If a tube is completely dead (but the filament lights up) then use the second procedure.

1. Operate the filament at 135% of rated voltage for 30 minutes. Test the tube. If it has improved but is still not up to rating, continue for another hour. If, at the end of this time, the tube is still not up to specification, move on to procedure 2.

2. In this procedure the filament is run white hot to strip the emitting surface completely clean, then the surface is restored using the above procedure. Operate the filament for 15 to 20 seconds at 350% of rated voltage with no other voltages applied. (Do not attempt to test at this point as there will be no emission.) Now operate the tube under the conditions given in the first procedure. Test the tube every 30 minutes, and if the tube is not up to rating after two hours it has reached its maximum emission capability. Although a tube does not meet its full transconductance specification, it still may be useable in many applications.

Typically the oxide emitter consists of a layer of strontium and/or barium oxide deposited on a heated surface. In the directly heated type, this layer is placed directly on the surface of the filament. Typical of this type are the Western Electric tubes such a the VT-1 and VT-2 as well as the WD11, UX226, and UX280.

The indirectly heated cathode is the more modern type of emitter. It consists of a metal sleeve with the oxide layer on the exterior and the filament mounted within the interior. The indirectly heated cathodes include the AC heater types such as the 24, 27 and the Kellogg tubes. The oxide emitter types should initially be operated at rated filament voltage for at least one hour and then checked for quality and stability.

If they still are not satisfactory, then the following procedure should be used. With the tube in the tube tester, increase the filament voltage to 120% of rating while carefully watching the plate current or tube tester meter reading. The meter reading will slowly increase, hit a peak, then start to decrease. At the point of maximum reading, reduce the filament voltage back to rated value. Continue to operate the tube at rated filament voltage for at least four hours, then test. When two tests spaced one hour apart provide the same reading, the tube is rejuvenated as much as is possible.

The rejuvenation of old tubes can be very rewarding, especially considering that some of them would otherwise be in the junk box. It does take time for this work and there are no short cuts, but it is something that can be done without constant attendance. While not all the tubes will come up to 100% of rating, many can at least be brought up to the point of being useable. As these old tubes become more scarce, tube rejuvenation may be the only way we will have of restoring vintage sets to operation.

I'd be pleased to correspond with any readers who have questions about tube rejuvenation.

BY DAVID W. KRAEUTER

SELECTED PATENTS IN ELECTRONICS

The following citations are often encountered in the literature of electronics, and are presented here as starting points that permit convenient entry into the patent specification volumes.

The author makes no claim that the citations determine "firsts" or that they represent the most important electronics inventions. Note that many years can pass between applying for a patent and the granting of the patent. Also, patent applications for many of these devices were made in more than one patent system.

This article is adapted from a forthcoming book, Electronic Inventions and Discoveries (fifth edition) by Geoffrey W. A. Dummer and David W. Kraeuter.

ISSUE YEAR	PATENTEE	PATENT SYSTEM AND NUMBER	DEVICE
1830	Ure	British 6,014	Thermostat
1837	Cooke and Wheatstone	British 7,390	Telegraph
1837	Davenport	USA 132	Electric motor
1838	Davy	British 7,719	Telegraph
1840	Morse	USA 1,647	Telegraph
1876	Fitz-Gerald	British 3,466	Rolled paper capacitor
1876	Bell	British 4,765	Telephone
1876	Bell	USA 174,465	Telephone
1877	Siemens	German 2,355	Loudspeaker, moving coil type
1878	Hunnings	British 3,647	Microphone, carbon granule
1879	Rapieff	British 211	Mercury arc lamp
1881	American Bell Telephone Company	USA 246,512	Microphone, carbon granule
1881	American Bell Telephone Company	USA 250,250	Microphone, carbon granule
1884	Holmes	British 3,256	Switch, quick break
1884	Clarke	USA 298,175	Battery, zinc-mercuric oxide cell
1884	Edison	USA 307,031	Edison effect
1884	Nipkow	German 30,105	Television
1885	Zipernowski, Deri and Blathy	British 5,201	Transformer, power
1885	Bradley	British 8,076	Resistor, moulded carbon composition type
1886	Slattery	USA 354,257	Resistor, moulded carbon composition type
1887	Holmes	British 5,648	Switch, quick make and break
1888	Tesla	British 6,481	Induction motor
1892	Edison	USA 474,230-2	Microphone, carbon
1893	Weston	USA 494,827	Battery (standard Weston cell)
1896	Marconi	British 12,039	Wireless telegraphy
1896	Voss	USA 573,558	Resistor, moulded carbon composition type
1897	Gambrell and Harris	British 25,412	Resistor, carbon film type
1898	Lodge	British 9,712	Loudspeaker, moving coil type
1898	Lodge	USA 609,154	Tuning
1900	Marconi	British 7,777	Wireless telegraphy
1900	Poulsen	USA 661,619	Magnetic recording
1901	Marconi	British 18,105	Coherer
1902	Lodge	British 13,521	Coherer
1902	Danielson	USA 694,092	Induction motor, synchronous
1902	Pickard	USA 708,070	Coherer
1904	Moscicki	British 1,307	Capacitor, glass tubular
1904	Fleming	British 24,850	Diode
1904	Horstmann and others	British 27,849	Time-switch for electricity

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ISSUE YEAR	PATENTEE	PATENT SYSTEM AND NUMBER	DEVICE
1905	Horstmann and others	British 27,290	Time-switch for electricity
1905	Ehret	USA 785,803	Frequency modulation
1906	Dunwoody	USA 837,616	Crystal detector, carborundum
1907	Rosing	British 27,570	Television
1908	De Forest	British 1,427	Triode (Audion)
1908	De Forest	USA 879,532	Triode (Audion)
1910	Fleming	British 23,242	Diode
1910	Fleming	USA 954,619	Diode
1911	Langmuir	USA 994,010	High-vacuum furnace
1912	Hogan	USA 1,014,002	Single dial tuning
1912	Alexanderson	USA 1,042,069	Amplifier
1913	Fessenden	USA 1,050,441	Heterodyne circuit
1913	Fessenden	USA 1,050,728	Heterodyne circuit
1913	Coolidge	USA 1,082,933	Tungsten filament
1914	Miessner	USA 1,104,065	"Cat's whisker"
1914	Pickard	USA 1,104,073	Crystal detector
1914	Armstrong	USA 1,113,149	Regeneration circuit
1917	De Forest	USA 1,230,874	Audion, metallic
1917	Lowenstein	USA 1,231,764	Negative grid bias
1917	Hull	USA 1,251,377	Constant direct current potentials
1919	Cahill	USA 1,295,691	Electronic organ
1919	Langmuir	USA 1,297,188	Variable currents
1920	Armstrong	USA 1,342,885	Superheterodyne circuit
1920	De Forest	USA Re-issue 14,959	Single-sideband transmission
1920	Armstrong	British 137,271	Superheterodyne circuit
1920	Eccles and Jordan	British 148,582	Eccles-Jordan circuit (flip-flop)
1921	Kruger	British 157,909	Resistor, metal-film type
1921	De Forest	USA 1,377,405	Grid leak detector
1922	Arnold	USA 1,403,475	Vacuum tube circuits
1922	Wilson	USA 1,403,932	Electron discharge
1922	Mitchell and White	USA 1,423,956	Tipless bulb
1923	Armstrong	British 182,135	Superregenerative circuit
1923	Armstrong	USA 1,416,061	Superregenerative circuit
1923	Espenschied and Bowen	USA 1,447,773	Automatic volume control
1923	Carson	USA 1,449,382	Single-sideband transmission
1923	Cady	USA 1,450,246	Piezo-electric resonator
1923	Nicolson	USA 1,459,412	Indirectly heated cathode
1923	Arnold	USA 1,465,332	Vacuum tube amplifier
1924	Baird and Day	British 222,604	Television
1924	De Forest	USA 1,507,016-17	Oscillating triode and feedback circuit
1925	Hazeltine	USA 1,533,858	Neutrodyne circuit
1925	Schottky	USA 1,537,708	Screen-grid tube
1925	Siemens and Halske	German 438,429	Resistor, cracked-carbon type
1926	Chamberlain	USA 1,573,374	Radio condensers
1926	Loewe	German 591,735	Resistor, sprayed metal film
1927	Lowenstein	USA 1,618,017	Straight line tuning condenser and circuit
1927	Colpitts	USA 1,624,537	Colpitts oscillator
1927	Carson and Carpenter	USA 1,640,881	A-C biased magnetic recording
1928	Wade	British 287,958	Pentode
1928	Conrad	USA 1,664,192	Aeriola Junior
1929	Lemmon	USA 1,702,833	Electrical condenser
1929	Kellogg	USA 1,707,617	Sound reproducing
1929	Rice and Kellogg	USA 1,728,879	Amplifying
1930	Farnsworth	USA 1,773,980	Television
1931	Kellogg	USA 1,795,214	Sound reproducing
1931	Round	USA 1,811,095	Thermionic amplifiers
1932	Boonton Research	British 382,945	Variable mu tube
1932	Ballantine and Hull	USA Re-issue 18,579	Demodulator
1932	Farrand	USA 1,855,168	Loud speaker
1932	Siemens and Halske	German 387,150	Resistor, cracked-carbon type
1933	Blumlein	British 400,976	Television scanning circuit

ISSUE YEAR	PATENTEE	PATENT SYSTEM AND NUMBER	DEVICE
1933	Rice and Kellogg	USA 1,894,197	Sound reproducing
1933	Freeman and Wade	USA 1,909,051	A-C tube
1933	Armstrong	USA 1,941,066	Wide-band frequency modulation
1933	Armstrong	USA 1,941,067	Announcement suppressor
1937	Blumlein	British 462,530	Constant resistance capacity stand-off circuit
1937	Farnsworth	USA 2,087,683	Image dissector
1937	Blumlein	USA 2,093,540	Stereophonic sound reproduction
1937	Du Mont	USA 2,098,231	"Eye" tuning tube
1938	Blumlein	British 482,740	Long-tailed pair circuit
1938	Zworykin	USA 2,141,059	Iconoscope
1938	Flechsig	German 736,575	Shadow-mask picture tube
1940	Varian	British 523,712	Klystron
1942	Carlson	USA 2,297,691	Xerography
1944	Carlson	USA 2,357,809	Xerography
1946	Whiteley	British 575,250	Saw-tooth generator
1947	Randall, Boot and Wright	British 588,185	Cavity magnetron
1947	Watson-Watt	British 591,130	Radar
1947	Watson-Watt	British 593,017	Radar
1947	Earp and Strong	British 594,530	Radio beacons
1949	Kompfner and Wright	British 623,537	Travelling waves tube
1950	Eisler	British 639,178	Printed wiring
1950	Nishizawa	Japanese 205,068	Pin diode
1952	Carlson	British 672 767	Xerography
1952	Carlson	British 679,533	Xerography
1953	Western Electric	British 694,021	Transistors
1956	Western Electric	British 752,412	Zener diode circuit
1957	Shockley	USA 2,787,564	Ion implantation in semiconductors
1958	Ginsburg and others	British 798,927-30	Television recording
1961	Jones, Gent and Browne	British 860,826	Boot-lace aerial
1962	Clark and others	British 886,660	Testing electrical components
1962	Minneapolis-Honeywell	British 886,910	Testing electrical circuits
1963	(Various)	British 940,016	Electronic telephone exchange
1964	Kilby	USA 3,138,743	Integrated circuit
1966	Wiessenstern and Wingrove	USA 3,256,465	Flip-flop bonding technique (flip-chip)
1967	Vogel and Cie	British 1,057,453	Electronic watch

NOTES:

1) Patent titles have been omitted here because of their vagueness. For example, the patent title for De Forest's Audion is "Space Telegraphy."
2) British patent numbers began a new series at the beginning of each year until the end of 1915; thereafter they are numbered in one continuous series.

SOURCES:

Baker, R. *New and Improved* (London: British Library Board) (1976).

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PATENT INDEXES:

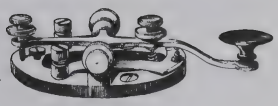
Annual Report of the Commissioner of Patents (Washington: Government Printing Office) (1876-1925).

General Index of the Official Gazette and Monthly Volumes of Patents (Washington: Government Printing Office) (1872-1876).

Index of Patents Issued from the United States Patent Office (Washington: Government Printing Office) (1920-).

Illustrated Official Journal (Patents). *Index to Names of Applicants for Patents* (London: HMSO) (Various years).

For a list of indexes to USA patents prior to 1872, see *Tables of and Annotated Index to the Congressional Series of United States Public Documents* (Washington: Government Printing Office) (1902) pp 556-560.



EDITED BY **JOHN CASALE,** W2NI, 3 PICKERING LN., TROY, NY 12180
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Signature of the Father

Many have heard the story about Samuel Morse's first telegraph message from Washington to Baltimore in 1844, but few have heard the story of what was considered to be his last message. This last message by Morse had a profound effect on all who copied it, and was considered an impressive demonstration of how the capabilities of the telegraph had evolved in just 27 years.

When Morse was approaching his eightieth birthday, it was felt among the telegraph fraternity at Western Union that a formal testimonial in the U.S. should be given to honor him. Several foreign countries had already recognized him with various decorations and medals. He had previously received a gratuity of approximately 60,000 dollars, from a special congress consisting of ten European countries, for the nearly 1300 Morse sets they had in service.

A day of celebration in New York City was planned for the tribute that included the dedication of a statute of Morse in Central Park, a boat excursion around Manhattan for telegraphers, and a reception at The Academy of Music. Morse would bid farewell to the telegraph fraternity by sending a specially composed telegraph message world-wide directly from the Academy, ending with him at the key, sending his own signature.

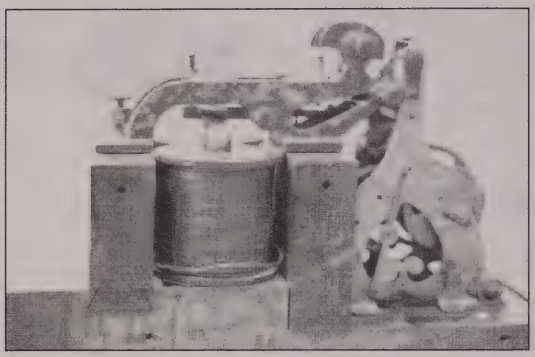
The father of the telegraph signs his final message.

The funds required for this tribute were raised primarily by the telegraph community. Requests for contributions to a testimonial fund were made in *The Journal of the Telegraph*, a Western Union trade newspaper published by James D. Reid, an author and editor long associated with the telegraph industry. L.G. Tillotson, a prominent telegraph instrument manufacturer and former telegrapher, protested the limiting of the fund to Western Union employees.

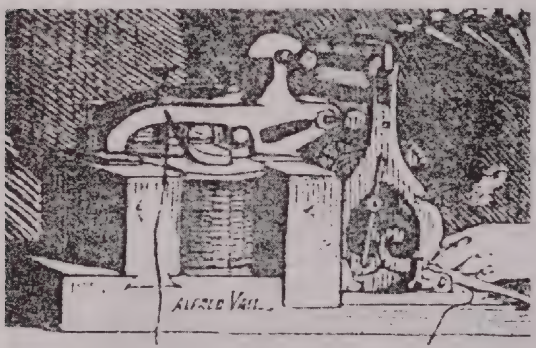
Reid concurred, and soon after contributions were accepted from the entire U.S.and Canadian telegraph fraternity. The overwhelming response created a list of contributors that was sixty feet long. Donations were made in amounts ranging from 25 cents to 25 dollars, but most were contributions of less than 5 dollars made by individual telegraphers.

Saturday, June l0th, 1871 was the day selected for the celebration. Telegraphers from across the country started to arrive in New York on Thursday, June 8. By Friday, they were arriving by the hundreds. The first event, scheduled for Saturday, was a complimentary excursion around New York harbor sponsored by L.G.Tillotson & Co. Telegraphers and other members of the fraternity gathered at Tillotson's 8 Dey St. store that Saturday morning to pick up their free tickets.

The firm, which was noted for its hospitality, had set up special displays. Fine examples of registers, keys, sounders, relays, etc. were well stocked on the shelves and available for inspection. At one point it was reported that some 200 people had crowded into the store. Tillotson' hos-



The telegraph register used to receive Morse's first test message in 1844 and pressed into service once more for the 1871 tribute. Photo by the author and used by permission of Cornell University College of Engineering.



Detail of the same register from the engraving of Morse at the signing ceremony.

pitality continued during the three-hour excursion, and music and food baskets were provided.

The unveiling of the Morse Statue was scheduled for 4:00 p.m. that afternoon. The weather cooperated; New York was enjoying clear skies and 74 degrees. The *New York Tribune* reported that at least 10,000 people had gathered for the ceremony, including a large number of telegraphers who distinguished themselves in the crowd by wearing badges made of white ribbon.

The unveiling ceremony included speeches made by various politicians and telegraph industry executives. Cyrus Field, who had orchestrated the Atlantic cable, read several congratulatory dispatches, including one from President Grant. Field gave an example of the international speed and distance capabilities of the telegraph with his remark:

I have another dispatch from a neighboring village, London, dated June 10, two minutes past eight p.m. where it was received here at five minutes to four.

Later in the ceremony, an oration was given by Morse's close friend, poet William Cullen Bryant. Morse, who was then eighty and probably the first U.S. telegrapher to reach that age, did not attend the first two events of the day in order to conserve his strength for the night's festivities at the Academy of Music.

The auditorium of the Academy was filled to standing room capacity that evening with those fortunate enough to have obtained the coveted tickets. Some 500 seats were provided on the stage alone to accommodate the prominent guests. At 8:00 p.m. Morse entered the auditorium and was greeted by cheers and white handkerchiefs waved by the ladies. He stepped onto the stage and was seated next to William Orton, the President of Western Union, who was the master of ceremonies.

Some of the notable people seated near him included Cyrus Field, Horace Greely (*New York Tribune* founder/editor), Governor Claflin of Massachusetts (Morse's birth state) and General Jefferson Davis (former President of The Confederate States of America). Also seated nearby, to Morse's pleasant surprise, was Annie Ellsworth. It was by her suggestion "What Hath God Wrought" was used as the first telegraph message in 1844.

Set up on the stage near the speaker's stand was a small table with the telegraph instruments to be used in the sending of Morse's message. Included was the original telegraph register used by Alfred Vail in Baltimore to receive that first historic message sent by Morse from Washington on May 24, 1844. This register, designed by Vail, was kindly loaned for the special occasion by Mrs. Alfred Vail, his widow.

Registers imprinted marks of short and long durations, separated by spaces, on a narrow strip of paper. These represented dots and dashes. But telegraphers quickly learned to copy code by listening to the sound of the register's pen lever hitting its stops. The terms "mark" and "space," still used in communications today, have their literal origin here.

The telegraph sounder evolved as an instrument to communicate the dots and dashes strictly

by sound. As Morse once described it:

The sounder is but the pen-lever deprived of the pen.

During the first hour of introductory remarks and speeches, the instruments on the table were concealed under a white tablecloth. They were connected, though, and during the first hour telegraphers seated in the orchestra seats nearby could copy traffic sounding from the muffled register as Western Union was busy putting together the massive network that was to handle the upcoming message. The telegrapher's winked and smiled as they listened to orders being sent out from New York when additional lines were cut in: *Close your key and clear out..., Answer on number 5..., Adjust that repeater.".*

(Repeaters allowed the automatic re-transmission of messages over long lines, thus eliminating the need for manual relaying from one circuit to another. The line from New York to New Orleans in the 1870s for example, was made possible by the use of two repeaters. The instruments were also used for repeating messages from a main line into multiple branch lines simultaneously.)

At 9:00 p.m., Mr.Orton announced that all the lines going to the principal cities and towns of the United States and Canada were connected to the instruments on the small table before them, and that Professor Morse's message was to be sent simultaneously to all of them. As the instruments were being uncovered from the table, Mr.Orton went on to say that a short pause was necessary to allow for any final adjustments of Western Union's repeaters before proceeding with the message. Miss Sadie E. Cornwell, an accomplished and beautiful Western Union telegrapher, was then escorted to the table to send the body of Professor Morse's message. The auditorium went silent as she sent:

Greeting and thanks to the telegraph fraternity throughout the world. Glory to God in the Highest, on Earth Peace, Goodwill to men.

The crowd, knowing what was to follow, cheered as Mr. Orton escorted Professor Morse to take Miss Cornwell's place at the table. Professor Morse took his seat and as he reached for the key, a complete stillness took place as hundreds of telegraphers, in a sea of white ribbons, leaned forward, straining to hear. Morse, with a steady firm hand, slowly sent his signature: *S F B Morse.*

(continued on page 69)

Miss Sadie E. Cornwell, the Western Union telegrapher who sent the body of the message.

SILENT KEYS

We record the passing of the following AWA members with deep regret.

FRANCIS M. DUKAT, K6NL, 88 (10-25-00) was originally licensed W1BOD in Hamden, CT in 1927.

LT. CMDR. ALFRED J. EDWARDS, USN Ret., 81 (9-4-00) authored technical manuals for Hazeltine Electronics Corporation, Allen B. DuMont Laboratories, Curtiss-Wright Electronics and Siemen's Electronics Company from 1946 to 1950.

ROBERT D. HOUGH, W8ESR (4-00)

JOSEPH WILLIAM MILLER, K4MM (7-8-00)

PETER PERROTTI, (8-17-00)

FRANCIS J. RODDY, (10-00)

HARRY C. SNYDER, (7-21-00)

FRAN H. THISSE, W2BJI & J37XC, 87, (11-30-00) former broadcast engineer with WSYR (AM-FM-TV) in Syracuse, NY. Fran, standing next to his car filled with ham gear, was a familiar sight at many AA meets.

Note: AWA officers and members are requested to submit all information about Silent Keys, with or without special recognition, to Joyce Peckham, Secretary, Box E, Breesport, NY 14816. This will help in the collection, coordination and appropriate recognition of both AWA members and others who have made contributions to the electronics and entertainment industries.

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KEY AND TELEGRAPH, *continued from page 67*

At the completion of the last dot, the crowd gave a standing ovation and cheered for several minutes. Morse returned to his seat and was quite visibly overcome with emotion by the crowd's reaction. Mr. Orton waved his hand to silence the crowd and announced:

Thus the Father of the Telegraph bids farewell to his children.

Telegraphers in stations everywhere also cheered after hearing Morse at the key. Many responses were quickly returned and copied on another set of instruments behind the stage at the Academy.

From Washington: *...Allow me to congratulate you on the success of Professor Morse's feat. It passed south on every wire, and I have two registered copies taken in presence of the whole newspaper representatives at the capitol.*

From New Orleans: *To him whose lightnings have enlightened the world...the telegraphers of New Orleans offer their congratulations.*

From San Francisco: *The telegraphers of the Pacific coast send greeting and the heartiest congratulations to the Father of the Telegraph.*

Later that evening, as Morse's message was relayed world-wide, similar messages were received from Singapore, Bombay, and Hong Kong. The festivities ended with a very reflective speech by Morse. In his speech he stated:

I look upon your proceedings as intended, not so much as homage to an individual, as to the invention whose lines from America have gone out through all the earth, and their words to the end of the world.

At its conclusion, several in the audience lined up for the opportunity and privilege to shake his hand. The tribute to Morse proved timely; ten months later he passed away at his winter home in New York City, leaving behind a legacy that immortalized his name in U.S. history.

REFERENCES

The New York Times, June 10, 11, 1871.
The New York Tribune, June 10, 11, 12, 1871.
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The Telegrapher, June 3, 10, 17, 24, 1871.
Modern Practice of the Electric Telegraph, Frank Pope, 1871.
The Telegraph in America, James D. Reid, 1879.
Samuel F.B. Morse, His Letters and Journals, Edward Lind Morse, 1914.
Henry and the Telegraph, William B. Taylor, 1879.

CLASSIFIED ADS

Old-time ads are free to members collecting and restoring equipment for personal use. Please observe the following: (1) one ad per issue per member; (2) include as SASE if acknowledgement is desired; (3) material must be more than 25 years old and related to electronic communications; (4) give your full name, address and zip code; (5) repeats require another notice (we are not organized to repeat automatically); (6) the AWA is not responsible for any transaction; (7) we retain the right to reduce an ad's size if over seven lines; (8) AWA does not accept commercial advertising in this column; and (9) closing date is six weeks prior to first day of month of issue. Ads received after that time will be held for the following issue. Mail all ads to: **RICHARD RANSLEY, P.O. BOX 41, SODUS, NY 14551**.

IMPORTANT!

OTB classified ads are now available for browsing in the "*OTB On Line Edition*" on our internet web site (www.antiquewireless.org). This practice will give members dramatically increased exposure for their ads.

SELL/TRADE—BC/SW TUBE RADIOS

Philco Tombstone (wood) Model 37-62, $35.; Tele-Tone 239 Catalin, $20.; Zenith 6D515 (6), $20.; Westinghouse H-156, $15. All are fully restorable. All plus UPS. Onerio Sabetto, 1717 Burgess Rd., Cleveland, OH 44112

Atwater Kent cases for Model 30 and 33, $10. each, cases for models 40 and 44., $8. each, Atwater Kent speaker Model F-4-A in good working order, $55.; TV-7 Operator's Maintenance Manual, $8. Joseph Kelber, 6120A SW 26th St., Topeka, KS 66614 (785) 228-9264

1940s radios: Braun, $80.; Tesla, $80.; Cossor, $80.; 1950s radios: Murphy, $50.; Mullard, $50.; Aga, $50.; Telefunken Atlanta, $90. Argirios Adamidis, Kampouridi 19, Panorama, Thessaloniki, Greece 55236 E-mail: aadam@acc.teithe.gr

SELL/TRADE—COMMUNICATIONS GEAR

Sell Hallicrafter SX99 receiver with speaker, no book. $100., plus UPS. Works but needs TLC. SASE to Bill Plimpton, W2IXH, RR6 Box 264. Wellsboro, PA 16901

SELL/TRADE—GENERAL

JBL Signature Series monaural speaker system (from 1959) with a #175 DHL driver horn assembly, #130 15" low frequency driver, N1200 crossover network in a 36" x 15¾" x 25½" mahogany cabinet; plus a Sherwood S-2000 AM/FM monaural tuner and S-1000-II 36 watt monaural amplifier (vacuum tube types). Rich Hi-Fi sound with deep bass. Speaker in excellent condition. Sherwood tuner and amplifier, both work but need reconditioning and some repair work. $595. Pickup only. (too big to ship) Robert Eckert, 133 East 7th Street, Clifton, NJ 07011-1104 (973) 340-0579

Victor RE-75 ornate 1929 radio/phono highboy, $250.; Sun 900 scope motortester which includes five instruments with scopes and meters, a 24" sign and a box of cables, $100. I am thinning my radio collection which includes consoles, various chassis, military and amateur units. Please send SASE for lists. Visitors welcome. Malcolm Burdick, W1NOO, 156 Station Rd., Hampton, CT 06247 (860) 455-9640 before 8:00 PM please

100 watt stereo system mounted in a Barzilay oiled walnut three-piece cabinet (made in California), Model 80E. It consists of a 4 ft. long console and two 2 ft. speaker cabinets all enclosed by tambour doors and a horizontal top-lift door on the equipment console. Inside has H.H. Scott 296 integrated dynaural laboratory amplifier, Fisher 200B FM tuner, Collaro RC 440 turntable/changer. Speaker cabinets are bass reflex design with 15" woofers, mid range speakers and tweeters made by KLH systems of Massachusetts. A beautiful 8 ft. console of walnut furniture professionally checked out. SASE for full

details. Francis Yonker, 1229 Inverary Place, State College, PA 16801 (814) 867-1400 E-mail: yonker1229@home.com

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Atwater Kent Model 20 big box, $80.; AK20 compact, $80.; AK30, $50.; AK35, $20.; AK37, $50.; Crosley 51 with 2 WD12s, $250.; Trirdyn Superspecial, $100.; Kolster K-20 with tubes and K-6 speaker. All radios untested. Tubes available but not included unless stated. Other 20s radios and misc. items available. Send LSASE for lists. Ray Schmidt, 2310 12 St. SW, Austin, MN 55912 (507) 433-3250

Have the following items to trade for a 1935 Model 835 Zenith chrome-front tombstone: Catalins, quality cathedrals, including 2 miniature cathedrals, A-K 'homebrew' breadboard, and a number of big black dial Zeniths (with ± cash, if necessary). Thanks! Chris Hicks. 57 Jameson Hill Road, Clinton Corners, NY 12514 (914) 266-4257 eves/weekends

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Measurements Model 59 Grid Dip Meter with manual, complete in excellent condition, $150.; National NC 1-10A, very clean, working w/one set of coils, $150.; National RBL-2 VLF receiver, working with manual, $175.; National NC-120 with extra RF amp., working, $175.; Clegg 22ER Six Meter Transceiver, clean, working, $75. All plus shipping. Stuart Carter II, W4NHC, 680 Fern Wood Drive, Melbourne, FL 32904-1995 (321) 727-3015

A rare collectible for Crosley fans! A new old stock Crosley Model 7-1 Shortwave Converter! Never sold, still has original paper wrapping on cord and the 5 antenna and oscillator coils. Uses 1-80, 1-27, and 1-24, which I can supply. These sets were sold without cabinets, and that is what this is. Has two dials, graduated 0-100. Includes schematic. An unusual item, $175. Charles Harper, 2000 Jackstown Road, Paris, KY 40361 (859) 484-9393 E-mail: charper@kyk.net

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Kadette Jr. parts radio, $99.; Zenith pop-up, $40.; three brass keys and many spare parts, $50. For all; Zenith 5L41 tube radio, $10.; Zenith 5D027 wood radio, $25. Winston 2 transistor radio with whip antenna, $95.; Zenith Transoceanic Dial-O-Map, $20.; Thomas Edison spark plug, $20.; TV magnifier, $20.; Acousticon tube hearing aid, boxed, $35.; Philmore mounted crystal detector in original package, $10. Bill Rolf, 30131 Center Ridge, Westlake, OH 44145 (440) 871-4547

Continental microphone #50, mounted in chrome ring, licensed by Elect. Research Prod. Inc., nice condition, $200.; Peerless cathedral cone speaker, $100.; broken tortoise shell bell for American Electric Burns horn speaker, $25.; selected sets of radio magazines for sale, send SASE. Floyd Paul, 1545 Raymond Ave., Glendale, CA 91201 (818) 242-8961

Old telephone—side hand crank, no dial, Jydsk Telefon Aktieselskab on front, Kristian Kirks Telefonfabriker A/S Horsens on the side. Nice condition, crank rings bell OK, $145. plus shipping. Ed Hlas, 47 Westview Ave., Hubbard, OH 44425 (330) 534-3280 E-mail: hlas@nlc.net

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SELL/TRADE—LITERATURE

Radio schematics & service data. $2.50 plus #10 SASE. (Price is for 1 to 5 pages of data per model, over 5 pages there is a 20 cent copy charge per page). American, Canadian and Australian receivers, 1920s to 1960s. Steve Rosenfeld, P.O. Box 418, Manahawkin, NJ 08050 (609) 597-2201 E-mail srosenfeld@ems.att.com

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QST - Aug. 1925; Feb., Mar., Oct., Dec. 1926; 1927 all but Jan.; 1928 complete; Apr., May, Jun., Jul, Aug., Sept., Oct. 1929; Nov., Dec. 1930; Jan., Feb. 1931; all in excellent condition, near new, $5. each plus shipping, write for volume discount. Henry Mohr, W3NCX, 1005 W. Wyoming St., Allentown, PA 18103-3131

PHILCO RMS year book, home and auto radio diagrams for years 1939, 1940, 1941 and 1942, $20. each plus shipping; Radio & TV Training Home Study Course, approx. 75 booklets, $70. plus shipping. Ed Hlas, 47 Westview Ave., Hubbard, OH 44425 (330) 534-3280 E-mail: hlas@nlc.net

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Antique radio schematics plus data for AWA members still only $3 postpaid. One day turnaround. Joseph Forth, 321 Long Vue Acres, Wheeling, WV 26003 E-mail: wa2trt@juno.com

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Do you need a schematic for a 1924-1967 Canadian tube radio? Please provide make & model/chassis number and approximate age. $5 per schematic (checks fine) to Dave Cantelon, 42 Clematis Rd., North York, Ontario, Canada, M2J 4X2 E-mail: justradios@yahoo.com Web site: http://www.geocities.com/justradios/

1928-43 European radio schematics, more than 1300 pages, $85.; 1936 volume of a French radio magazine "Toutela Radio", 484 pages containing radios, early TVs, amplifiers, articles and

photos, schematics, $30.; 1932-38 Telefunken radio service book with photos of parts layouts for 43 models, 90 pages, $20. (copies only), shipping extra. Argirios Adamidis, Kampouridi 19, Panorama, Thessaloniki, Greece 55236 E-mail: aadam@ acc.teithe.gr

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Instruction manuals for Collins 75A-1, 75A-2, 51J-4, KWM-1, KWS-1, 30L-1, 75S-1, 32V, 32V-2, 32V-3 Johnson Ranger, Valiant, Challenger, Navigator, Viking II, Courier, National HRO-5A1, HRO-7, HRO-50, HRO-60, NC-183C, NC-200, SW-54. A. J. Bernard, P. O. Box 690098, Orlando, FL 32869-0098 (407) 351-5536

Twenty years of horn speaker articles which appeared in *The OTB* is now available in booklet form. Index of manufacturers is extensive. Six copies left. Priced at $11.50. Floyd A. Paul, 1545 Raymond Ave., Glendale, CA 91201 (818) 242-8961

SELL/TRADE—MILITARY

Collins GRC 27 UHF T217A GR transmitter Ser. No. 58 & MODL TR Power Supply Ser. No. 61 MD 129A. Units are heavy! Ed Hlas, 47 Westview Ave., Hubbard, OH 44425 (330) 534-3280 E-mail: hlas@NLC.net

SELL/TRADE—PARTS

Ohmite plate choke Z-7. New in box. $4.50 postpaid, U.S. mainland. John Uscinowski, 95 Vly Summit Road, Greenwich, NY 12834-9519

SELL/TRADE—TEST GEAR

Hickok 630 Peak to Peak Voltage Calibrator, mint, $25.; Hickok 4900-S Radio Set Tester, $20.; EICO 377 Audio sinewave and squarewave Generator, mint, $20.; EICO Multiplex Generator, mint, $20. All plus UPS, Onerio Sabetto, 1717 Burgess Rd., Cleveland, OH 44112

Heathkit Model V7A VTVM, Linearity Pattern Generator Model LP2, Paco B10 12V Power Supply and Battery Charger, Knight Capacitor Checker, $20. each. Also eye tubes 6E5, 6U5 used, tested, $3. each. Robert Martin, 111 Bancroft Dr., Rochester, NY 14616 (716) 663-4182

Early Heathkit (1950) Battery Eliminator Model BE-2, Condenser Checker Model C-2, 5" Oscilloscope Model O-5, Vacuum Tube Voltmeter Model V4A, High Voltage Probe Kit 310 (unassembled), TV Alignment Generator Model TS-2. All are in excellent condition with manuals. Clough-Brengle Co. Model 0CA RF Signal Generator 1930s vintage. Betz Laboratories Conducto-Bridge Model X50. Bill Hurni, W3HWT, 329 Evergreen Dr., North Wales, PA 19454 E-mail: bill_hurni@merck.com

SELL/TRADE—TRANSISTOR/CRYSTAL SETS

Crystal galena, or fools gold, $2/each. New design. Machine screw mounting. Leonard. Gardner, 458 Two Mile Creek Road, Tonawanda, NY 14150

Old shirt pocket transistors, $20.; excellent condition, $30.; with original box, $40.; early Stern transistor radio in wooden cabinet (very good cond.) from former East Germany, $130.; old transistor radio from Poland, $30. Argirios Adamidis, Kampouridi 19, Panorama, Thessaloniki, Greece 55236 E-mail: aadam@acc.teithe.gr

SELL/TRADE—TUBES & TRANSISTORS

Over 1,200 NIB tubes, low prices. Includes octals, locking and miniatures from late 1930s thru early 1960s. SASE for list. Herman Fothe, 5292 Tiffany Ann, West Palm Beach, FL 33417

Type 6D5 and 6Z6 tubes made by Triad, NIB. Make offers to R. Ahmann, W7SC, 3932 S. Mesa View Lane, Boise, ID 83706-6052

WANTED—GENERAL

Looking for ANY Clough-Brengle Co. equipment and literature. ANY background or historical information on Clough-Brengle Co, especially on transmitters built for the Civilian Conservation Corps. Needed for future article for OTB. Ron Lawrence, P.O. Box 3015, Matthews, NC, 704-289-1166, kc4yoy@trellis.net

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Detrola 175 or 204 series wood tabletop radio with motorized pushbutton tuning. Working or not. David Kaiser, 375 Yarmouth Road, Rochester, NY 14610 (716) 654-6604

Theater sound equipment by Western Electric or Electrical Research Products Inc. such as loudspeaking telephones, drivers, receivers, horns, amplifiers, their manuals or parts units, and vacuum tubes. Please tell me what you have available. Thanks! Ming Yang, 1995 University Avenue, #119, Berkeley, CA 94704 (925) 376-4220 E-mail: WEsys@aol.com

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I would like to correspond with someone from the general areas of Houston, Austin or Dallas, Texas who may have plans to attend the 2001 AWA Conference in Rochester and who may be planning to fly or drive to same, for the purpose

of sharing trip and/or accommodation arrangements and expenses. Please contact Bruce Wright at (281) 443-6337 or E-mail: wc5cw@arrl.net

Want Presto Model #K-11 disc recorder and Brush Model # BK-401 tape recorder. Gaylord Ewing, 155 Main Street, P.O. Box 144, Morris, NY 13808 E-mail: lewing@citlink.net

PHILIPS-Norelco "AM-FM Deluxe" multiband with transformer instruction booklet (and booklet alone), aligned and working; also want 67 1/2 VDC battery eliminators from the 30s to 50s, such as Maxell, Lafayette or Radio Shack; White's Radio Logs; additionally want good working, aligned Motorola "Playmate Junior" 5A5 (tube type). Thank you. Al Sherry, P.O. Box 1051, Riverdale, NY 10471

U.S. or Canadian Forest Service radios, any model or condition, especially an "SPT" set. Typical manufacturers include Spokane Radio, Spilsbury, Radio Specialty, Oregon Electronics, Western Wireless, and others. Have classic communications gear and telegraph keys to trade or cash Rick Ferranti, WA6NCX, 1341 Cedar Street, San Carlos, CA 94070-4755 (650) 859-2857 or E-mail: remler@juno.com

WANTED—INFORMATION

Seeking schematics for a Grebe TRF, Ser. No. 318118. Tube line-up is 3-24A tetrode RF amps., 1-27 triode detector, 2-45 triode push-pull power output amps., transformer coupled input and output, 1 type 80 full-wave rectifier. Also need schematic for A-K Model #99 superhet. Tube line-up is 3 type 35 tetrodes, 1 type 24A tetrode, 3-type 27 triodes, 2 type 47 push-pull pentode pwr. out amp., 1 type 80 full-wave rectifier. Has an IF freq. of 130 kHz. Any info as to where these schematics may be found would be appreciated. Irvine Lowe, 58 Wareham St., Middleboro, MA 02346

Radio researcher desperately needs photocopies of issues of "Canadian Wireless" magazine, June 1921-July 1922 and any subsequent, for projected book on Montreal Marconi W/T and radio station XWA. Contact Arthur E. Zimmerman, 514 Brunswick Avenue, Toronto, Ontario M5R 2Z5, Canada (416) 923-2001 E-mail: arthurz@ look.ca

WANTED—KEY & TELEGRAPH

Telegraph Bugs (speed keys) by unusual manufacturers and odd configurations like left-handed, vertical, right angle, over and under, key/bug combinations etc. Also looking for large spark era keys and pre-1870 landline gear. Gil Schlehman, K9DWY, 335 Indianapolis St., Downers Grove, IL 60515 (630) 968-2320

WANTED—LITERATURE

Any literature, books, brochures, catalogs, advertising, etc. related to pre WWII television and radio. In any form - individual pieces or whole collections. Thank you! Rob Carobene, POB 650206, Fresh Meadows, NY 11365 (718) 281-0504 E-mail: cphobia@bway.net

Schematic or manual for Heathkit Regulated Power Supply Model PS-4. Photocopy OK. Thanks! Harry Johnson, 2012 Hawthorne Lane, Evanston, IL 60201

Want the following QSTs to complete my collection: 1916—Feb., Apr., May, Jun. and Aug.; 1917—Mar.; 1919—Jan. and Aug.; 1921 - Jan. and Feb. Ed White, WA3BZT, 809 Seymour Road, Bear, DE 19701 (302) 322-1313 E-mail: wa3bzt@ wserv.com

Schematic diagram or manual for RCA AVR-15 aircraft receiver. Al Kaiser, W3LEQ, 713 Marlowe Road, Cherry Hill, NJ 08003-1551

"Radio Home" and/or "Radio in the Home" magazine. This magazine was published in Philadelphia from 1922-1926. John Okolowicz, 624 Cedar Hill Rd., Ambler, PA 19002 (215) 542-1597

Copies of "Audio Record", "Audiotape" catalogs, and any other publications by Audio Devices Inc. Peter Keller, W1CRT, 7445 SW Bayberry Dr., Aloha, OR 97007

WANTED—PARTS

Grebe CR-18 top loading coils. Also need the meter coils for same. Ron Woods, 12004 Dapple Ct., San Diego, CA 92128-5228 (858) 651-4072

WANTED—TEST GEAR

Hewlett-Packard Model 606A or B Signal Generator. Bruce Roloson, 2 Walnut Place, Apalachin, NY 13732 E-mail: broloson@stny.1run.com

WANTED—TUBE RADIOS

WTR*Cleartone, Clearodyne, Gold Crest, Faraway, and Silverset Radios made in Cincinnati in the early 1920s. Merrill Bancroft, 169 South Row Rd., Townsend, MA 01469 E-mail: ritareo@juno.com

MUSEUM, continued from page 76

Paul is moving from the area and will be missed as a real contributor to the AWA.

We're also preparing a new museum brochure, complete with updated photos, as the current supply is exhausted. It will remain simple, two color, and is an interim design until the new museum initiative is better defined.

Mark your calendars now for the always fun AWA Spring Meet at the Museum Annex to be held May 5th. See details elsewhere in this issue. While the calendar is out, mark down April 21st as this Spring's Saturday work session beginning at the Annex at about 9:00 a.m. Everyone is invited to come and help out.

It was fun working a lot of you during the Bruce Kelley 1929 QSO Party and the Linc Cundall OT CW Contest. I ran W2AN's loop antenna through a modeling program and found the input impedance to be over 1,200 ohms. No wonder the antenna tuner capacitor keeps arcing over. We'll fix that and get W2AN's big AM signal back on the air soon.

This Christmas saw a lot of people ordering the new AWA CDs containing back issues of *The OTB* and a wonderful index for doing research. We had to ship a few last minute orders via priority mail, but they all got out in time for the holiday. See ordering details in this issue.

New Research Tool!

Index of *The OTB, The AWA Review*, and other AWA documents from beginning of publication through March, 2000. Available on either paper or 3.5-inch floppy disk (text format, searchable with your word processor). Introductory price: $9.00 postpaid for either version ($7.00 with any purchase of $19.00 or more from following page). Limited quantities—order today!

The *OTB* index is still available separately in either paper form or on a 3.5 inch floppy.

This spring the AWA Museum will be hosting the Guelph, Ontario, Hammond Museum of Radio Board of Directors meeting. I am delighted that the wonderful tradition of cooperation and friendship that Bruce Kelley and Fred Hammond, VE3HC, had during their museum formative years, continues today.

S'long for now.

Ed Gable

Ed Gable K2MP/W2AN
Curator, AWA Museum

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John O. Archibald W2ME	Spark TX, Murdock, Blue Racer, tubes, more
Charles Bliley K3NAU	Singer TV6U portable TV, 1966, working
Stephen Beaulieu	Large magazine collection, SX-190 rcvr
Ed Gable K2MP	Pagers, cell phones, Caller ID system
Jackie Gumtow	Sprague Tel-o-Mic, tubes, tube tester, more
John Ward KE2ST	Large collection, 30 items, audio, ham, tubes, more
Tony Zukas W3ELE	DX-100, NC-240D speaker
Robert LaDuca	Gundlach crystal set
Russ McKay WA2CBU	Atwater Kent 30, good, working
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George Dundon W2TOH	Cash donation in memory of Francis (Cuz) Thisse
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OTB BACK ISSUES

The following back issues of *The Old Timer's Bulletin* are available at $3.00 each postpaid, with a 20 percent discount for six or more issues and 30 percent off for 12 or more. Please indicate alternative choices when ordering back issues of *OTB*.

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36-4 History of Rogers Batteryless Receivers
37-1 T.V.-Dr. Ernest Alexanderson, Part 1
37-2 T.V.-Dr. Ernest Alexanderson, Part 2
37-3 Evolution of the Auto Radio, Part 1
37-4 Reginald A. Fessenden and the Development of Radiotelephony
38-2 DeForest Gang Hits Colorado-Part1/Nathan Stubblefield-Forgotten Pioneer of Wireless-Part 1
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THE MUSEUM

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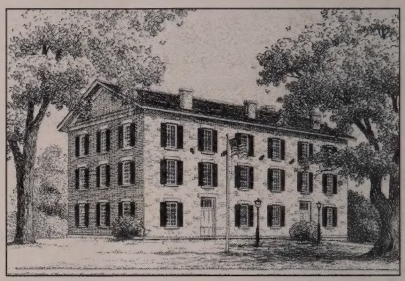
Curator: Ed Gable



Mailing Address:
Ed Gable, Curator, AWA Museum,
187 Lighthouse Rd., Hilton, NY 14468
e-mail: k2mp@eznet.net

MUSEUM NEWS

Hello and greetings from myself and the crew of your museum. I hope and trust each of you had a nice holiday season and I wish you all a prosperous and Happy New Year. Lots to talk about so we'll get right to it.

The museum workers are busy getting ready for the May 5th opening. New displays include one I've wanted to do for awhile: a working teletype system. Alan Pellnat, KX2H and Duncan Brown, K2OEQ, took the old model 19 and a newer 60s vintage printer/perforator, applied lots of WD-40 and a few tricks of the trade and got 'em working just fine. They will be demonstrated as a closed loop across the room. The message storage device...perforated paper tape, will also be shown and demonstrated.

Another new display will be a "Made in Rochester" exhibit showcasing communications devices that were manufactured locally. Not only will this be an interesting collection of new and old equipment, but it is also designed to acquaint local businesses with the AWA and your museum. Certain artifacts in current displays will be replaced with others to maintain a fresh look.

At the Annex you will see that new work benches have been assembled in the back of the Library. These are equipped with current test equipment to allow repair and restoration work on several pieces simultaneously.

In the meantime other crews are busy with a new venture to catalog our extensive magazine and periodical collection headed by Bob Perry, W2TIX. Once cataloged, Doc Ely, W2ODW, with what must seem like a never ending task, boxes and finds shelf space for the hundreds of pounds of paper. It's starting to look really good and we can actually walk up and find specific items now.

The multi-year task of formally accessioning artifacts into the collection and data base continues, but at a less than brisk pace. I would like to thank again Paul Norder, KG2EP, who set up the *Past Perfect* software package and accessioning systems.

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